

Directional Physics



An exposition of the directional theory: from $E = Mc^2$ to cosmology

Author: L'Architech (Gabriel Breton-Breault)

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Chapter 1 — $E = Mc^2$: From Confined Light to Dynamic Energy

Introduction: rereading the founding equation

No formula is more famous than the one formulated by Albert Einstein in 1905: $E = Mc^2$. It establishes a fundamental relationship between mass and energy, and it is generally read as the conversion of one into the other. However, this reading is based on Euclidean geometry and on a classical conception of the speed of light. Directional physics proposes to take the equation from its foundations, not to reject it, but to reveal its deep structure.

Three principles serve as a starting point for this reinterpretation. Mass is a set of confined strings. Light is a liberated string. Energy is a directional tension. In this framework, the speed of light c is no longer a geometric parameter but a maximum directional intensity, and each term of the equation takes on a new physical meaning.

This chapter follows a multi-step progression. We will begin by reformulating the equation itself, examining what the term "squared" actually means and establishing that mass is immobilized light. We will then distinguish between two energy regimes, one confined where the energy is finite, the other released where it tends to infinity, and then we will open the particle to describe its internal energy architecture. We will then distinguish between the state of energy and its quantity, before showing that the equation is dynamic: mass varies with rotation, geometry and confinement, and energy varies with it. Finally, we will see what becomes of the equation on the scale of the entire universe, when we divide it by n^∞ to describe the collapse and cyclical rebirth of the cosmos.

The directional reformulation of the equation

The meaning of "squared"

In the classical formulation, the term c^2 is interpreted as a geometric square. This interpretation assumes a two-dimensional geometry, a surface-type relationship and a Euclidean structure. However, in directional physics, the dimensions are not Euclidean, the directional tension is not a surface and the propagation of light is not an area. The expression "squared" therefore has no physical meaning.

The term must be reinterpreted. It is written:

$$c \times c = \text{intensité directionnelle maximale}$$

and not as a geometric square. The product $c \times c$ denotes the maximum directional tension, the one that a confined rope can reach as long as it remains confined. The equation takes the form as follows:

$$E = M \cdot c \cdot c$$

where M is the directional mass, i.e. the sum of the confined strings, c is the maximum directional speed and $c \cdot c$ is the maximum directional tension. This writing eliminates the conceptual difficulty of the square and expresses a simple idea: energy is the mass multiplied by the maximum directional intensity.

The light contained in the mass

The presence of c in the equation implies that light is intrinsically related to mass. A massive particle is a confinement of light. A confined string represents a unit of mass, while a released string represents a unit of light. The photon is precisely a released string, and mass corresponds to immobilized light.

Einstein's equation then describes a real physical transition, that of confined light to released light. Mass and light are not separate entities: mass contains light in the form of directional tension. This point is crucial for the rest of the book, because it makes mass not a primary substance, but a particular state of light, the one where it can no longer propagate freely.

The photon and the two energy regimes

The mass of the photon

Einstein assumed that the photon has no mass at rest. This assumption is correct in classical physics, but directional physics reads it differently. A photon is a liberated chord, and a string always has a directional voltage. This voltage corresponds to a directional mass, infinitesimal but not zero. It simply cannot be measured at rest, because the photon cannot be immobilized.

The question is therefore ontological rather than mathematical: it was concluded that the photon had no mass because it could not be stopped. In the directional model, the photon has a directional mass equal to that of a freed confined rope. This precision is what makes it possible to understand the transition from Mc^2 to Mc^∞ .

The confined regime: $E = Mc^2$

The classical equation remains valid in its domain. It applies when the particle is stable, all its strings remain confined, the internal tension is maximum but finite, and no strings are released. In this regime, c represents the maximum directional velocity and $c \times c$ the finite maximum directional tension. The energy is entirely contained in the confinement.

This regime describes the stable mass, whose internal tension persists as long as the particle does not release any strings. This is the state of ordinary matter, the one whose structure holds by itself.

The liberated regime: $E = Mc^\infty$

When a string is released, it becomes a photon. Its frequency can then tend to infinity, its directional tension too, and its propagation is perpetual. Its directional mass becomes persistent, infinite in time. The energy of the photon is written:

$$E_{\text{photon}} = m_{\text{photon}} \cdot c \cdot \infty$$

which condenses into $E = Mc\infty$. This expression describes the extreme state of light: an infinite directional intensity applied to an infinitesimal mass. An infinitesimal mass multiplied by an infinite directional intensity gives an infinite energy.

This formulation is compatible with several phenomena: the capture of photons by black holes, the gravitational deflection of light, indefinite propagation and the directional nature of light voltage. It leads to the final formulation: energy is mass multiplied by the maximum directional intensity, or by directional infinity in the case of the photon.

Two equations, two domains

The two equations are therefore correct, each in its own domain. The confined regime, where the internal strings are stable and the tension finite, obeys $E = Mc^2$. The released regime, that of the photonic string with infinite tension, obeys $E = Mc\infty$. The total energy is the sum of two components: E_1 , the internal tension of the confined strings, and E_2 , the directional tension of the released string.

When the particle releases a string, E_2 becomes infinite, while E_1 remains finite or zero depending on the remaining structure. The total energy then becomes:

$$E = E_1 + E_2 = Mc\infty$$

This is the complete directional version of the mass-energy relationship. The confined state is where the voltage is finite, the released state is where it becomes infinite, and the complete relationship unifies them into a single coherent structure.

The internal energy architecture of the particle

Mass and Containment Energy

The decomposition $E = E_1 + E_2$ can be thought of from the inside of the particle. In this perspective, mass is no longer a primitive quantity: it is the result of an internal energy architecture, linked to the directional structure of the particle. The total energy is broken down into E_1 , the confinement energy, and E_2 , the energy of the internal strings:

$$E = E_1 + E_2 = Mc^2$$

The confinement energy is the component associated with the particle's confinement geometry, its directional coherence and the local space-time structure that holds it. It is modeled by a confinement frequency $\nu(\text{conf})$:

$$E_1 = h \nu_{\text{conf}}$$

where h is Planck's constant. The particle is then a directional node in space-time, whose stability depends on this confinement frequency.

The energy of the internal strings

A particle is not an indivisible point, but a confinement containing a set of directional strings. Let N be the number of internal strings. Each string has a natural frequency ν_i , and these strings interact to form a resonance structure. The energy of the strings is the component related to this internal structure, a function of the set of frequencies: $E_2 = f(\nu_1, \nu_2, \dots, \nu_N)$. A coherent directional form of this energy is:

$$E_2 = h \sqrt{\sum_{i=1}^N \nu_i^2}$$

This expression conveys the contribution of each string, the collective nature of the resonance, and the directional dimension of the internal structure.

Mass as a signature of the structure

By equalling the total energy to Mc^2 , we obtain the expression of mass:

$$M = \frac{1}{c^2} \left(h \nu_{\text{conf}} + h \sqrt{\sum_{i=1}^N \nu_i^2} \right)$$

Mass is no longer a simple constant associated with the particle, but the energetic signature of its internal structure. It bears the trace of the containment geometry, the number of strings, the directional frequencies and the collective resonance.

Several consequences follow. Mass becomes an emergent property of the internal structure and not a primitive quantity. Particles can be classified according to the number of N strings and their frequencies ν_i . Mass becomes an indicator of internal directional tension. Finally, the same principles can be extended to larger structures, stars, black holes, or attractors, which builds a bridge to cosmology.

Energy as a state: $E = \infty$

Distinguishing between condition and quantity

So far, energy has been described by quantities and voltages. The model $E = \infty$ approaches the question from another angle, explicitly distinguishing between the quantity of energy and the ground state of energy. This distinction leads to the fundamental expression:

$$E = \infty$$

The symbol ∞ does not mean that a photon, particle, or system contains an infinite amount of energy. Infinity represents the state of energy itself. Measurable quantity is a manifestation of this state when it is organized, divided, added, distributed, or confined within a physical structure. $E = \infty$ therefore does not mean "infinite amount of energy": it means "infinite energy state."

This reading sheds new light on the photon. The amount of energy associated with a photon can remain measurable, while the energy state of which this quantity is the manifestation is infinite. The photon is then described on two levels: $E(\gamma) = \infty$ for its energy state, and $Q(\gamma)$ for its quantitative manifestation. There is no contradiction between a state defined as infinite and a finite energy measure, because the two expressions describe two different properties. One says what the state of energy is, the other how much energy is measurable in a given manifestation.

The division of energy

Energy can be divided, distributed, confined, recombined, or transformed. These operations change its physical manifestation and the associated observable amount, but they do not change its ground state. The principle is this: nothing is lost, nothing is created. Energy changes division, distribution, confinement, or manifestation, but its ground state remains.

If Q_E represents the quantity manifested and it is divided uniformly among n components, each is equal to:

$$Q_i = \frac{Q_E}{n}$$

and the joining of the components gives the initial quantity:

$$\sum_{i=1}^n Q_i = Q_E$$

Division does not therefore make energy disappear; it modifies its distribution. Here we must distinguish between the existence of energy and its distribution: a division acts on distribution, not on fundamental existence. The model can be summarized by the following conceptual relationship: the energetic state, then division, then observable manifestation. The state is the fundamental property, division is the organizing mechanism, and manifestation is what becomes measurable.

The division can be successive. A first division can be followed by a second, then a third, which is conceptually written:

$$E \rightarrow \frac{E}{n_1} \rightarrow \frac{E}{n_1 n_2} \rightarrow \frac{E}{n_1 n_2 n_3} \rightarrow \dots$$

This writing does not mean that conventional mathematical infinity becomes a finite value. It represents the stages of division of the energetic manifestation. Each additional division increases

the depth of organization of the energy, which makes it possible to speak of a depth of division, whatever it may be: $E = \infty$ continues to represent the state.

Division and confinement are closely linked. When an energy is confined in a physical structure, its state remains infinite while its manifestation becomes defined and measurable. Two levels of operations then coexist: at the fundamental level, the state $E = \infty$ remains; at the manifest level, the quantity is distributed according to $Q_E \rightarrow Q_1 + Q_2 + \dots + Q_n$.

The addition of energy

Every division calls for its complementary operation, addition. Addition occurs when several energetic manifestations are brought together in the same structure, the same confinement or the same system. It does not create the fundamental energy: it brings together already existing manifestations. If quantities $Q_1, Q_2, \dots, Q_n$ are combined, the total quantity is $Q_T = \sum Q_i$, and it can increase locally while the state remains $E = \infty$.

Addition can produce a greater concentration of manifestations in the same confinement. Several separate manifestations then become a collective manifestation. Addition can also be successive: $Q_1 + Q_2 = Q_A$, then $Q_A + Q_3 = Q_B$, then $Q_B + Q_4 = Q_C$, and so on. When several manifestations are directed towards the same confinement C, the quantity present becomes $Q_C = Q_1 + Q_2 + Q_3$. The confinement contains a larger manifestation, but its state is still described by $E = \infty$.

Division and addition are two opposite directions of the same energy organization. The first distributes, the second groups, and in both cases the ground state remains. A quantity Q_T divided into Q_1, Q_2 and Q_3 , and then reunited, finds its grouped manifestation: the energy has changed its distribution without necessarily changing its total quantity. It should be noted, however, that the grouping can produce a new physical organization, i.e., a quantitative addition, a concentration, a redistribution, a new confinement or a transformation of the manifestation. The ground state is not determined by the particular form that the manifestation takes.

The measuring instrument does not necessarily observe the state $E = \infty$; it measures a quantitative manifestation. When a quantity is added to a system, $Q_A + Q_B = Q_T$, the instrument notes the increase of Q_T . This increase does not mean that the ground state has become "more infinite". Infinity is not a quantity to which another is added: it qualifies the state. Thus, $\infty + n$ does not give more infinity, and the quantitative operation applies to Q , while $E = \infty$ remains the description of the state.

The general principle

The general principle is as follows: division is not a disappearance of energy but a redistribution of its quantitative manifestation; addition is not a creation but a grouping of manifestations. The ground state remains $E = \infty$. The complete chain is written:

$$E = \infty \rightarrow \text{division} \rightleftharpoons \text{addition} \rightarrow \text{distribution} \rightarrow \text{confinement} \rightarrow \text{observable manifestation}$$

Nothing is lost, nothing is created; division distributes, addition regroups. Energy does not need to change its fundamental state in order to change its manifestation. The state remains, while the organization changes.

Dynamic mass

A living equation

For more than a century, the equation $E = mc^2$ has been presented as a fixed relation, a static formula that describes a state rather than a motion. This reading forgets that an object in motion does not have the same mass as an object at rest. Mass reacts, it deforms, it increases under the effect of motion, rotation, directional tension and centrifugal force. It varies according to speed, radius of rotation, geometry of the system and confinement.

Therefore, if mass varies, so does energy. Einstein's equation is no longer a simple fixed equality: it becomes a living, evolving equation that is sensitive to directional conditions. It describes not only what mass is, but what it becomes when it is set in motion.

Dynamic mass is mass as it exists in motion and not at rest. It depends on the angular velocity, the radius of rotation, the tension exerted on the structure, the directional geometry of the system, and the confinement or absence of it. It allows us to describe objects not only by their material, but by their behavior in directional space.

Centrifugal force as a mass amplifier

Centrifugal force is often reduced to a simple apparent force, a side effect of circular motion. In directional physics, it plays a structural role: it is a true mass amplifier. When an object rotates, it experiences a radial tension that tends to move it away from the center of rotation. This tension changes the internal distribution of mass, increases its directional resistance, and raises its effective mass. As the angular velocity increases, the centrifugal force increases, and the dynamic mass increases.

Classical physics recognizes that kinetic energy increases with speed, but it does not recognize that mass itself increases with rotation. This omission creates an inconsistency in the interpretation of the equation, which becomes unable to describe extremely rotating systems, directional structures, or confined masses. Centrifugal force acts as a multiplier: it transforms resting mass into dynamic mass, amplifies internal tension, changes directional geometry, and increases the total amount of energy contained in the system. It explains why some systems seem to produce more energy than they consume, and why some directional structures resist extreme forces.

Directional geometry

Traditional physics describes space as a fixed frame of three linear dimensions. Directional geometry offers a different interpretation: dimensions are dynamic. In a moving system, they deform, contract, stretch and reorient themselves, in response to speed, tension, confinement

and centrifugal force. The number of dimensions is not a constant parameter, but a geometric behavior.

The principle of this geometry is that mass creates its own geometry. It imposes directions, tensions, axes of rotation, and containment zones, and the more the mass is in motion, the more complex that geometry becomes. Centrifugal force does not only act on mass: it acts on space itself, stretches dimensions, increases directional tension, and amplifies dynamic mass. Geometry becomes a physical actor, not a scenery. Mass depends on geometry, geometry depends on motion, and the equation becomes dynamic because space itself is dynamic.

Directional containment

Confinement is what allows a moving mass to remain mass rather than disperse. In a directional system, mass is not just a collection of particles: it is a living geometric structure, subject to internal tensions, centrifugal forces, and dimensional variations. Without confinement, these forces would tear the mass apart. Confinement acts as a directional cohesion, an internal force that keeps mass in a steady state despite extreme tensions.

It is not an external force but an internal property of mass, generated by its directional geometry. It depends on the shape, rotation, tension, and dynamics of dimensions. The faster the mass rotates, the stronger the confinement must be; the more the centrifugal force increases, the more it must compensate to prevent dispersion. The stability of mass is not automatic: it is the result of a directional equilibrium. Without confinement, centrifugal force would increase the effective mass until breakage; with it, mass can increase, stabilize, and retain its structure. He explains why mechanical, biological, or cosmic structures can reach extreme speeds without disintegrating, and he connects geometry, mass, and energy into a unified system.

String theory completed

These elements make it possible to situate classical string theory. It is based on the seductive idea that particles are vibrating strings and that the universe is an immense symphony of strings. But, according to directional physics, it sets parameters that are not fixed in physical reality. It assumes a limited and stable number of strings, whereas these strings are dynamic structures whose number varies with mass, rotation and internal dynamics. It imposes a framework of ten or eleven immutable dimensions, while the dimensions contract, stretch and reorganize. Finally, it describes free strings without describing the internal force that maintains the coherence of a rotating mass, i.e. confinement.

The classical theory is therefore not wrong: it is incomplete. Directional physics provides it with what it lacks: variable chords, variable dimensions, essential confinement, dynamic mass and energy that depends on movement. Energy is not only contained in mass: it is generated by its dynamics.

Bolas, MDS and extreme rotations

Directional physics manifests itself in real systems. The simplest is the bolas: two masses connected by a rope rotate around a center of rotation. As the speed increases, the tension in the

rope increases, so does the centrifugal force, and the effective mass of objects increases. The phenomenon can be observed without sophisticated instruments: the rope tightens more, the resistance increases, the directional stability increases, and the mass seems to weigh more. The bolas shows that dynamic mass is a physical reality accessible to all.

The SMD, Directional Mass System, is the evolved version of the bolas. It does not just rotate: it organizes the rotation, structures the tension and concentrates the mass in an optimized directional geometry. Centrifugal force is channeled into it, directional geometry imposed, internal confinement maintains consistency, effective mass increases measurably and the total energy far exceeds that of the mass at rest. It shows that dynamic mass can be controlled, amplified and stabilized.

In extreme rotations, the dynamic mass becomes spectacular. Objects seem to acquire additional mass, increased strength, and energy disproportionate to their mass at rest. The phenomenon is seen in centrifuges, planetary structures, rotating stars, high-speed mechanical systems, and artificial confined masses. Kinetic energy alone does not explain this: mass increases because geometry deforms, because directional tension increases, and because confinement keeps the structure coherent.

Mathematical demonstration

The classical formulation assumes the mass m constant. Directional physics abandons this assumption: mass becomes a function of motion, geometry and confinement. A distinction is made between the resting mass m_0 and the dynamic mass m_d , which depends on rotation and tension:

$$m_d = m_0 + \Delta m$$

where Δm is the mass increase due to centrifugal force, directional geometry, and confinement.

For an object of mass m_0 rotating at angular velocity ω at a radius r , the classical centrifugal force is $F_c = m_0 \cdot \omega^2 \cdot r$. In the directional reading, this force does not only act on the trajectory: it increases the effective mass. We write:

$$\Delta m = k \omega^2 r$$

where k is a directional coefficient that depends on the geometry, confinement and internal structure of the system. The dynamic mass becomes $m_d = m_0 + k \cdot \omega^2 \cdot r$.

The energy is no longer $E = m_0 c^2$ but:

$$E_d = m_d c^2 = (m_0 + k \omega^2 r) c^2$$

which can be separated into:

$$E_d = m_0 c^2 + k \omega^2 r c^2$$

The first term is the energy at rest; the second is the directional energy generated by the dynamic mass.

In a confined system, the geometry is not neutral. Δm can be refined as a function of the geometry G and the confinement C : $\Delta m = f(\omega, r, G, C)$, e.g. $\Delta m = k(G, C) \cdot \omega^2 \cdot r$, where $k(G, C)$ increases with geometric complexity and with the confinement force. The energy becomes $E_d = (m_0 + f(\omega, r, G, C)) \cdot c^2$. The general form of the dynamical equation is therefore written:

$$E(\omega, r, G, C) = m(\omega, r, G, C) c^2$$

where $m(\omega, r, G, C) = m_0 + f(\omega, r, G, C)$. Mass is a function, energy is a function, and motion, geometry, and confinement are integrated into mass.

The energy transformation of directional systems

These elements form a coherent whole. Mass increases with rotation, not only because of velocity but also because of directional tension, dimensional deformation, and internal resistance of confinement. Centrifugal force stretches the geometry, increases tension, and raises dynamic mass; confinement prevents dispersion and allows mass to absorb that tension. Mass increases because motion increases, and energy increases because mass increases.

The total energy of a directional system then depends on the mass at rest, the dynamic mass, the directional tension, the centrifugal force, the variable geometry and the internal confinement. Mass becomes a function of motion, energy a function of dynamic mass, and the relationship between mass and energy is no longer linear: it is directional. The dynamic energy that arises from it exceeds the energy at rest and reflects the true nature of systems in motion. We simply write:

$$E = m_d c^2$$

Energy is no longer only contained in mass: it is generated by the dynamics of mass.

Dynamic energy

A third level of description

The $E = \infty$ model distinguishes between the state of energy and its observable quantity. But these two levels are not enough to describe energy when it participates in a moving system. Energy can move, interact with other manifestations, be confined, change direction, concentrate, or participate in the transformation of a system. This property is dynamic energy, denoted E_D : the manifestation of energy considered through its movement and interactions.

Three levels are therefore superimposed. $E = \infty$ is the state of energy. Q_E is the quantity of energy. E_D is dynamic energy. Dynamic energy does not mean that energy appears out of nothing: it describes how an existing quantity produces a different physical manifestation

according to its dynamics, its movement, its confinement and its interactions. The principle remains: nothing is lost, nothing is created.

The movement of energy

Movement does not create fundamental energy; it modifies the dynamic state of the energetic manifestation. The conceptual relation is written $Q_E + \rightarrow E_D$ motion. It is not yet a quantitative equation, but it expresses the relationship between the energetic quantity and its dynamic behavior. It is thus necessary to distinguish between the increase in quantity and the increase in dynamic manifestation, which are not the same thing.

When a manifestation moves from region A to region B, the former loses a local manifestation and the latter receives it: $Q_A \rightarrow Q_B$. Energy was not destroyed in A and then created in B; it moved. Movement is an essential mechanism for understanding how energy changes manifestation without violating the principle of conservation.

In the directional framework, the movement also has a direction, which participates in the organization of the manifestation. An energy evolving in a given direction interacts differently with another according to their respective directions, their meeting point, their configuration, their confinement and their relative movement. We write conceptually:

$$E_D = f(Q_E, M, D, I, C)$$

where Q_E is the energetic quantity, M the movement, D the direction, I the interactions, and C the confinement. This is a conceptual function of the model, the precise quantitative relationship of which remains to be defined. It follows that $E_{D1} \neq E_{D2}$ is possible even when the state remains $E = \infty$: the variation relates to the dynamic manifestation. The state remains, the quantity is redistributed, and the dynamic manifestation evolves with the movement and interactions.

The interaction of energy

Consider two manifestations Q_1 and Q_2 , whose total quantity is $Q_T = Q_1 + Q_2$. Their interaction can change their organization, movement, or dynamic manifestation without Q_T becoming Q_T more of a created quantity. The apparent additional energy is therefore not necessarily an energetic creation: the interaction modifies the manifestation of the existing energy rather than creating a new one.

An interaction can be constructive: $E_{D1} + E_{D2} \rightarrow E_D$ resultant, with a dynamic manifestation greater than that of each separate component, without the ground state having increased. It can also be opposite: the observable result is then reduced, reoriented or redistributed, but this apparent decrease is not a destruction. The decrease in the observed effect is not a destruction of energy.

The relative direction plays a role: two identical quantities can produce different manifestations depending on their orientation. Relative motion also matters: manifestations can move in the same or opposite directions, intersect, converge, diverge, evolve at different speeds or encounter

a common confinement. Dynamic energy thus becomes inseparable from the relationship between movement and interaction.

Confinement imposes a common organization on several manifestations: $Q_1 + Q_2 + \dots + Q_n \rightarrow C$, and the observed dynamic energy becomes $E_D = f(Q_T, M, D, I, C)$. It does not create the energetic quantity; it modifies the conditions in which it manifests. Finally, several manifestations can form a collective behavior: the dynamic energy of a system depends not only on the quantities present, but on the way in which they move, organize and interact. The process can be summarized as follows:

$$Q_E \rightarrow \text{movement} \rightarrow \text{interaction} \rightarrow \text{transformation} \rightarrow E_D$$

The dynamic equation $E \leftrightarrow M$

We can now relate these levels to the original equation. The relation $E = Mc^2$ establishes a direct link between energy E and mass M . In the dynamical energy model, it is interpreted as a reciprocal dynamical relationship, $E \leftrightarrow M$: a change in energy changes the mass associated with the system, and a change in mass leads to a change in the associated energy. E and M are not two independent properties, but two related manifestations of the same physical system.

The equation can be read in both directions: from $E = Mc^2$, the mass is expressed $M = E / c^2$, hence $E \rightarrow M$ and $M \rightarrow E$. If the energy varies from E_1 to E_2 , the corresponding masses are $M_1 = E_1 / c^2$ and $M_2 = E_2 / c^2$, with $\Delta E = E_2 - E_1$ and $\Delta M = M_2 - M_1$, which gives:

$$\Delta E = \Delta M c^2$$

Modifying the energy therefore amounts to modifying the corresponding energy mass. Conversely, if M_1 evolves towards M_2 , then $E_1 = M_1 c^2$, $E_2 = M_2 c^2$ and $\Delta M = \Delta E / c^2$. Reciprocity is written as $\Delta E \rightleftharpoons \Delta M$: mass and energy are two related variables whose variations must be considered together. It is this reciprocity that forms the basis of the dynamic equation.

Motion adds an extra dimension. For a system in motion, relativistic physics uses the energy-momentum relationship:

$$E^2 = p^2 c^2 + m^2 c^4$$

where p is the momentum and m is the invariant mass. In the model, this reality makes it possible to distinguish between the energy state, the energy quantity, the motion, the dynamic energy and the dynamic mass. The dynamic energy is then related to the dynamic mass, M_D , according to $E_D \leftrightarrow M_D$: interactions, motion, confinement and redistribution modify the dynamic manifestation of the system, and the modification of the dynamic energy is accompanied by that of the dynamic mass. This is written: $\text{interaction} \rightarrow \Delta E_D \leftrightarrow \Delta M_D$.

This dynamic does not mean that energy or mass-energy appears out of thin air. A local variation can correspond to a transfer, a redistribution, an interaction, a change in confinement, a

transformation, an emission or an absorption. The dynamical equation is used to track the relationship between the mass and energy manifestations during this transformation. It does not replace the principle $E = \infty$: the latter describes the ground state of energy, while $E = Mc^2$ describes the dynamical relationship between energy and mass. The overall structure is then:

$$E = \infty \rightarrow Q_E \rightarrow \text{movement} \rightarrow \text{interaction} \rightarrow E_D \leftrightarrow M_D \rightarrow \text{physical manifestation}$$

The dynamical equation therefore does not only describe a numerical correspondence between mass and energy: it represents the reciprocal relationship by which any modification of one must be considered with the corresponding modification of the other.

The equation on a cosmic scale: $(E = Mc^2) / n^\infty$

Beyond the formed universe

In the deep structure of the universe, everything is energy. Matter is a confined form of this energy, antimatter an inverted form, light a free vibration, and dimensions internal geometry. The equation $E = Mc^2$, in its classical form, describes the universe after its formation, when internal geometry already exists, light is confined, and the God Particle stabilizes mass and dimensions. It says nothing about the origin, death, collapse, rebirth, or directional cycle of the universe. To describe them, we must introduce the infinite fragmentation of energy:

$$E = \frac{Mc^2}{n^\infty}$$

Here, n is a directional factor, a cosmic coefficient capable of dividing energy into an infinity of fragments. It is neither a fixed number nor a constant, but a dynamic variable related to the geometric tension, the proximity of the binary systems, the directional spiral Φ , the inverse spiral $-\Phi$ and the internal structure of the God Particle. When the two binary systems, matter and antimatter, come together, n increases; when the cosmic tension reaches its maximum, n tends to infinity.

Dimensional Collapse and the Zero State

When n tends to infinity, mass tends to zero, light ceases to be confined, centrifugal force cancels out, internal geometry collapses, and dimensions dissolve. The universe reaches a critical point that is not an energetic threshold but a geometric threshold. The process is not gradual: it is instantaneous and total. It is neither a destruction nor a disappearance, but a total defragmentation of energy.

The regions of matter (Φ) and antimatter ($-\Phi$) are each structured by a directional spiral, with Φ being the positive spiral and $-\Phi$ the inverse spiral. As the two binary systems come together, their spirals deform, stretch, compress, and lose their directional coherence. At $n \rightarrow \infty$, Φ and $-\Phi$ become indistinguishable, the internal directions cancel each other out, the internal geometry ceases to exist, and the two local universes neutralize each other.

The God Particle, the confining surface that traps light, creates mass, stabilizes dimensions and organizes internal geometry, then loses its cohesion: the directional tension becomes infinite, the surface is torn, the light is released, the mass disappears and the dimensions close. It is not a destruction but a geometric deactivation. Since dimensions are only the internal geometry of the God Particle, the spatial dimension disappears, the temporal dimension ceases to be directional, the metric is cancelled out and space-time ceases to exist. The universe does not become a material point: it becomes a directional point, a pure vibration, without extent, without duration, without structure.

In this zero state, E still exists but tends to 0, M tends to 0, c^2 remains the fundamental structure, light is free, geometry is absent, the spirals Φ and $-\Phi$ are neutralized and the binary systems annihilated. Infinitesimal free energy is the fundamental substrate of the cycle, the only thing that remains. The universe has returned to its starting point, but not to nothingness. This state is not stable: even divided by n^∞ , energy is never zero, vibration is never lost, and directional tension is never destroyed. It is an absolute compression, a cosmic pause where the universe awaits the reconstruction of its geometry.

Here, on the scale of the cosmos, we find the lesson of the $E = \infty$ model: energy divided to infinity does not disappear, because its ground state remains.

The cosmic explosion: $n^\infty = E = Mc^2$

The reversal of the zero state is the reverse transition:

$$n^\infty = E = Mc^2$$

It is the moment when infinite fragmentation ceases and energy refocuses. It ceases to disperse, to dilute, to be free and to be infinitesimal, and to recompose itself into a single coherent structure, instantaneously, totally and directionally. Energy regains its maximum density, vibration its confinement and geometry its orientation: this is the directional Big Bang.

The God Particle is reformed. It is not a particle in the classical sense but a confining surface, a directional membrane that traps light, stabilizes mass, opens up dimensions, organizes internal geometry, defines the direction of time, and separates the spirals Φ and $-\Phi$. Around the vibration, it closes, captures light, and recreates mass. Free light is suddenly trapped, its vibration is confined, it acquires inertia and becomes mass. This is the fundamental passage $E \rightarrow M$: light becomes matter, vibration becomes structure, energy becomes geometry. This capture is the basis of all directional physics, and it shows that mass is not a primary property but a consequence of directional geometry.

With the surface of confinement the dimensions are reborn: the spatial dimension opens, the temporal dimension regains its direction, the metric reactivates, space-time reappears. The centrifugal force, which is not independent but a consequence of the internal geometry, is also reactivated: the internal rotation reappears, the directional tension is restored, and the

centrifugal force is the first force to be reborn, the one that organizes the universe and separates matter from antimatter. The mass becomes stable as long as the God Particle remains intact, which allows the formation of atoms and structures.

Spiral separation and the formation of binary systems

Internal geometry is not reborn in the form of a single structure. It is naturally and automatically divided into two opposite spirals: Φ , a positive spiral that corresponds to matter, and $-\Phi$, an inverse spiral that corresponds to antimatter. This separation is not a choice but an obligatory consequence of the reconstruction; it is inscribed in the very structure of the reconfined energy. The two spirals are not destructive opposites but geometric complements. They define the direction of time, the internal rotation of the mass, the centrifugal tension, the polarity of the energy, the structure of the attractors and the dynamics of the filaments.

Two cosmological regions appear, two twin universes: the Φ region, a universe of matter with a positive spiral, directional attractors, coherent filaments and stable galaxies; the $-\Phi$ region, a universe of antimatter with an inverted spiral, inverted attractors, mirror filaments and inverted galaxies. Φ tends to extend in one direction and $-\Phi$ in the opposite direction. The expansion is not isotropic: it is directional, guided by the internal spirals.

In each region, the captured light is reconcentrated in areas of extreme density, the primary attractors, directional geometries where the internal voltage reaches a maximum. Directional condensation, positive rotation in Φ and inverse rotation in $-\Phi$, strengthens them to a critical density: they become hypermassive black holes, of matter in Φ and of antimatter in $-\Phi$. Around them are organized giant spirals, future arms of galaxies, cosmological filaments and fractal structures. The spiral is not an aesthetic motif but the directional signature of internal geometry.

In each region emerges a dominant attractor and a secondary attractor, which orbitalize and synchronize into a cosmological binary system, the fundamental structure of the region. Directional synchronization, coherent rotation in Φ and inverse in $-\Phi$, creates a stable directional tension, orbital dynamics, and cosmological coherence that allow binary systems to remain stable for billions of years. Around them unfold the filaments, stretched by expansion, stabilized by tension, organized by spirals, and fractalized by centrifugal geometry: these are the roads of matter. Each binary system becomes the heart of a local universe.

The complete cycle

The Φ and $-\Phi$ regions move away after the explosion, but their internal dynamics slowly bring them back towards each other. The directional tension is fractal, the giant spirals expand, the hypermassive attractors distort the metric, and the filaments create geometric bridges. This slow but inevitable rapprochement prepares for the next cycle. When the two binary systems meet, their spirals compress, their attractors deform, their geometry becomes unstable, and the tension reaches a maximum. The collision is not a destruction but a geometric neutralization: the spirals become indistinguishable, the God Particle loses its cohesion, and the light ceases to be confined.

The complete cosmic cycle consists of ten phases:

1. Directional separation $\Phi / -\Phi$;
2. fractal expansion;
3. formation of binary systems;
4. cosmological convergence;
5. Final collision;
6. dimensional collapse;
7. infinite fragmentation of energy;
8. Geometric reconstruction;
9. Cosmic explosion;
10. nouvelle séparation $\Phi / -\Phi$.

This cycle is eternal, inscribed in the very geometry of energy. The universe is not born once and will not die once: it is born in each cycle.

Anilation and the representation $\phi / -\phi$

In this cosmology, the collision is called Anilation. It is neither a destruction, nor a local explosion, nor a disappearance of matter: it is a geometric neutralization, an erasure of internal directions, a return to the zero state of the cosmos. It is the passage from geometry to pre-geometric, from structure to vibration.

Matter is represented by ϕ , the lowercase of the golden ratio, a natural directional spiral. Antimatter is represented by $-\phi$, i.e. ϕ turned 180° , with the vertical lines perfectly aligned. Thus ϕ designates matter and $-\phi = \phi$ to 180° designates antimatter. The two forms are geometrically complementary, and their vertical alignment expresses perfect neutralization: it represents the disappearance of internal rotation, the erasure of directional poles, the loss of centrifugal tension, the neutralization of spirals, and the collapse of internal geometry.

When ϕ and $-\phi$ align, we represent the passage:

$$\varphi + (-\varphi) \rightarrow 0 \text{ directionnel}$$

This directional zero is not a numerical zero but a geometric zero, where the dimensions disappear, the mass tends towards zero, the light becomes free and the energy fragments to infinity. It corresponds to E / n^∞ and immediately prepares the reversal $n^\infty = E = Mc^2$: reconstruction of the God Particle, capture of light, rebirth of mass, separation $\Phi / -\Phi$ and beginning of a new cycle. Anilation is the door between two universes, the threshold between two cycles.

Conclusion

The equation $E = Mc^2$ thus appears in a new light. In its confined version, it expresses that mass is immobilized light and that energy is a finite directional voltage, produced of mass by the maximum directional intensity $c \times c$. In its liberated version, $E = Mc^\infty$, it describes the photonic string, an infinitesimal mass carried by an infinite tension, and the complete relation $E = E_1 + E_2$ unifies the two regimes. Seen from the inside, the particle is a directional node whose mass is the energetic signature of its confinement geometry and its internal strings.

The model $E = \infty$ adds that infinity characterizes the state of energy and not its quantity: division distributes, addition groups, and nothing is lost, nothing is created. Dynamic energy, with its function $E_D = f(Q_E, M, D, I, C)$, accounts for motion, direction, confinement and interactions, while dynamic mass $m_d = m_o + k \cdot \omega^2 \cdot r$ shows that the centrifugal force, the mass amplifier maintained by confinement, makes Einstein's equation a living equation, $E \leftrightarrow M$, where any variation in one leads to that of the other. Finally, divided by n^∞ , the equation describes the dimensional collapse and, reversed, the cosmic explosion from which each new cycle of the universe is born.

Directional physics is therefore not presented as an extension of classical physics, but as a correction and rewriting: it preserves the equation while revealing the deeper physical structure where mass, energy, motion, geometry and confinement are intimately linked.

Chapter 2 — Directional String Theory

Directional string theory offers a new way of understanding matter, light, gravity, and the structure of the universe. It is based on a simple but profound idea: every particle is a vibrating string confined in an omnidirectional wave. This wave, called directional confinement, acts as an internal structure that gives the string its physical properties: mass, inertia, direction, stability, and interaction with space-time. This chapter takes a step-by-step look at this construction, from the string itself to the spheres of dense matter, and then to the method of counting the strings of a particle from the light it releases.

The theory differs from traditional models in one central concept: a dimension is not a mathematical axis, it is a possible direction that a string can take. The internal geometry of matter is therefore not defined by abstract coordinates, but by vibrational orientations. Each particle has an internal dimension that aligns, reorients itself and moves in space according to the vibration of its string.

Why a new theory?

Current models — general relativity, quantum mechanics, classical string theory — describe the Universe with great precision, but they remain fragmented. Mass is explained by the Higgs field, gravity by the curvature of space-time, light by photons, and matter by point particles or mathematical strings. Directional theory seeks to unify these phenomena into a single physical structure: the vibrating string and its omnidirectional confinement.

This approach makes it possible to explain the origin of mass, the nature of the photon, the dynamics of motion, gravity as a directional gradient, the expansion of dimensions, the compatibility between matter and antimatter, and even directional propulsion by spheres of dense matter (GDS). It does not juxtapose distinct mechanisms: it deduces them all from the same principle.

Directional vision

The fundamental principle is that physical reality is directional. Every vibration, every movement, every interaction is a matter of orientation, alignment, and reorientation. Matter is not a static object: it is a dynamic vibrational structure that explores the directions of space.

In this vision, the string vibrates in a single internal dimension, while the confinement vibrates in all directions. Matter moves by reorienting its internal dimension, the photon reveals a free direction, gravity is a directional tension, and dimensions emerge from the expansion of the Universe. The goals of the theory flow from this framework: to describe matter as a confined vibration, light as a free vibration, mass as a directional tension, gravity as a frequency gradient, dimensions as possible directions, the Universe as an expansion of directions, and SMD propulsion as a manipulation of directional geometry.

The string: one-dimensional vibration

The string is the fundamental element of the theory. It represents the smallest conceivable physical unit, not in the form of a point particle, but as a pure directional vibration. It is not a material object: it is an oscillation, a frequency, and an internal direction. It forms the basis of all matter, light, energy, and dynamics observed in the universe.

Nature of the rope

A string is defined by four essential properties: an oscillation frequency, an energy proportional to this frequency, an internal direction and an own mode of oscillation. It is one-dimensional: it vibrates in a single internal dimension, which gives it a privileged vibrational axis. This internal dimension is the source of the directional dynamics of matter.

Oscillation in 1D space and origin of spin

The string oscillates in a strictly one-dimensional internal space, up and down, along a single axis. This oscillation has a fundamental consequence: the one-dimensional oscillation of the string is what generates the spin of a particle. An oscillation oriented towards a positive internal configuration corresponds to a spin up, and an oscillation oriented towards a negative internal configuration corresponds to a spin down. Spin is therefore not an abstract or mathematical property: it is the direct expression of the internal oscillation of the string in its 1D space.

Directional alignment

The internal dimension of the string can align in any direction of space. This alignment is dynamic and changes with each pulse. Each pulse reorients the internal dimension and thus produces a directional movement in the external space. This mechanism makes possible the movement of matter, rotation and interaction with space-time.

The photon: the free rope

When a string is not confined, it becomes a photon. A photon is a free string, a pure vibration, a revealed direction, a massless energy that propagates at the maximum speed allowed by space-time. It represents the simplest and purest form of directional vibration. It retains only its frequency, energy, and internal direction; it has no mass, inertia, or internal directional tension.

Its trajectory reveals a directional dimension: the direction it takes corresponds to a dimension of space. A free rope has no mass, inertia, or stability. It is only when it is confined in an omnidirectional wave that it acquires mass, inertia, internal geometry, and stable dynamics. The rope then excites the surface of the confinement, generating a directional tension that constitutes the origin of the mass.

Confinement: omnidirectional wave

Confinement is the internal structure in which the vibrating string is held. It is an omnidirectional standing wave, occupying a spherical volume around the string. This wave determines the mass, stability, dynamics, and interaction of the particle with spacetime. In theory, it represents the geometric equivalent of the Higgs field, expressed in a vibrational and directional form, hence the directional Higgs expression.

Definition of Directional Containment

Confinement is a spherical wave that vibrates in all possible directions, has a stationary structure, has no spin, reacts to the internal oscillations of the string, and stabilizes the one-dimensional vibration. It is not a material membrane: it is an omnidirectional vibration that fills the internal space of the particle.

The confinement wave vibrates in all directions simultaneously. Each point on its surface represents a possible direction in which the rope can orient its internal dimension. This omnidirectionality allows for movement in any direction, rotation, inertia, and stability of internal vibration. Confinement acts as a directional sphere, providing a continuous set of possible directions.

Spin-free and Higgs field link

Confinement has no spin, like the Higgs boson (spin 0). Its vibration is isotropic, uniform and omnidirectional. It is in this sense that confinement is the geometric expression of the Higgs field. This absence of spin allows a stable and uniform interaction with the string.

Internal geometry of the particle

Confinement defines the internal geometry of the particle: a vibrating sphere, a directional surface, a continuous set of directions, a stable structure that allows internal vibration. The particle is therefore not a point. It is a vibrational structure composed of a string, or a set of strings, and their confinement.

Cosmological role of confinement

In a given space, confinement can vibrate in only one way. This vibration sets the laws of physics, makes matter and antimatter compatible, and causes every particle to share the same mode of confinement. For a universe to have different laws, it must have a different mode of confinement, and therefore a different directional Higgs.

The directional origin of the mass

In this theory, mass is not an intrinsic property of a particle. It is neither a fixed attribute nor a fundamental parameter imposed by nature. It is a dynamic consequence, an emergent phenomenon resulting from the interaction between the string, which oscillates in a single internal dimension, and the confinement, which vibrates in all possible directions. Mass appears when the one-dimensional vibration of the string excites the surface of the omnidirectional wave, creating directional tension.

Ground as directional tension

The mechanism unfolds in five stages. The string oscillates up and down. This oscillation propagates over the surface of the confinement. The omnidirectional wave absorbs and redistributes this vibration in all directions. A directional tension appears, and this tension is perceived as a mass. The mass is thus the resistance of the confinement to the internal vibration of the string: the more the string excites the surface of the confinement, the more the tension increases, and the higher the mass.

Two energy sources

Mass results from two energetic contributions. The first is the internal energy of the string, denoted E_1 , which is the energy of the one-dimensional oscillation and depends on the frequency of the string, the amplitude of the oscillation, and the internal direction. The second is the external energy of confinement, denoted E_2 , which is the energy of the omnidirectional wave and depends on the vibrational frequency of the confinement, the surface excited by the string, and the number of strings present in the confinement. The mass is the sum of these two energies:

$$E_1 + E_2 = Mc^2$$

This equation expresses mass as a vibrational voltage, not as a fundamental property.

Influence of the number of strings

A particle can contain one or more strings in the same confinement. The more strings there are, the more they vibrate, the more excited the containment surface, the more the directional voltage increases, and the higher the mass of the particle. The mass is proportional to the number of strings confined and the intensity of their vibration.

This principle explains why some particles are more massive than others, why heavy matter has a more complex internal structure, why matter is stable, and why mass is an emergent rather than an intrinsic property.

Role of confinement and zero mass of the photon

Confinement plays an essential role in the creation of mass: it absorbs the internal vibration of the string, redistributes it in all directions, creates directional tension, stabilizes the particle, and fixes its internal geometry. Without confinement, the string becomes a photon, the vibration is free, no directional tension appears, and mass is zero. Mass exists only when the vibration is confined. It is not removed from the photon: it simply ceases to exist when the confinement disappears.

Mass, inertia, and directionality

Mass is directly related to inertia. A strongly confined rope produces a high directional tension, and this tension resists changes in the orientation of the internal dimension. This resistance is perceived as inertia: inertia is the difficulty in reorienting the internal dimension of the rope when the directional tension is high. Mass and inertia are therefore two manifestations of the same phenomenon, the directional tension of confinement.

Directional dimensions

A dimension is defined in a physical, intuitive and directional way: it is a possible direction that a rope can take. This principle transforms the traditional understanding of space. Dimensions are no longer fixed entities, but vibrational orientations accessible to the rope and revealed by its confinement.

Setting a dimension in a directional way

A dimension is a possible orientation of the internal vibration of the string, an accessible direction on the surface of the confinement, a potential axis of propagation for a photon, and an emergent geometry of space. Dimensions are the physical directions offered by space to vibration. This definition directly relates the internal structure of particles, the propagation of light, the dynamics of motion, and cosmological geometry.

The center of the sphere

Confinement has a spherical geometry. At the center of this sphere, a rope can orient its internal dimension towards any point on the surface, which implies a continuous set of directions, a continuous set of dimensions, and complete freedom of orientation. The confinement sphere defines the set of dimensions accessible to the string: the larger it is, the more possible directions there are, and therefore the more dimensions there are.

Expansion of the Universe and expansion of dimensions

The Universe is not static. It expands, and this expansion has a direct consequence: space gains new directions, and therefore new dimensions. Dimensions are not fixed, they emerge and expand with the Universe. This explains why space seems to have a complex directional structure, why light can take an infinite number of trajectories, and why cosmic geometry evolves over time.

The photon, revealing dimensions

A photon is a free string whose trajectory corresponds to a revealed directional dimension. Each photon takes a direction, each direction is a dimension, each dimension is a vibratory possibility

of space. Light thus reveals the dimensions of the Universe. The photon does not explore a predefined space: it reveals the directions that space makes available to it.

Internal and external dimensions

The theory distinguishes between two types of dimensions. The internal dimensions are the possible orientations of the one-dimensional vibration of the string; they define the spin, the internal dynamics, and the fundamental vibrational direction. The external dimensions are the possible directions on the surface of the confinement; they define the movement, rotation, propagation in space, and geodesics of light. Matter moves by reorienting its internal dimension to an external dimension.

Dimensions and rotation

When a particle rotates, the inner dimension of the string changes orientation, the string explores new directions, and the particle explores new dimensions. Rotation is a dynamic exploration of directional dimensions. This mechanism accounts for precession, inertial dynamics, curved trajectories, and gyroscopic behaviors.

Motion, inertia and rotation

The movement is not a classic translation in a predefined space. It is the result of an internal mechanism: the reorientation of the vibratory dimension of the rope within the confinement.

Movement as a reorientation

The string oscillates in a single internal dimension, and this oscillation has an orientation that can change. When a pulse changes this orientation, the string points in a new direction, the confinement reacts by aligning its vibratory surface, and the particle moves in the outer space. The movement is therefore the direct consequence of the reorientation of the internal dimension of the string. This mechanism replaces the classical notion of force: a force is only an influence that modifies the internal orientation, and displacement is the directional response of confinement.

Transmission through confinement

When a string changes its internal orientation, the vibration reorients, excites a new area of the containment surface, the omnidirectional wave redistributes this excitation, and the particle moves in the corresponding direction. Confinement acts as a directional converter: it transforms an internal orientation into an external trajectory, stabilizes the movement and ensures continuity of direction.

Inertia: resistance to reorientation

In this model, inertia has a directional origin: it is the resistance of the confinement to the reorientation of the internal dimension of the string. The higher the mass, the greater the directional tension, the more excited the confinement, the more it resists a change of orientation and the greater the inertia. A light particle easily reorients its internal dimension; a heavy particle has difficulty reorienting it. This naturally accounts for the dynamics of masses, accelerations, deceleration and curved trajectories.

Rotation, precession and stability

Rotation is not a circular motion imposed by an external force, but an internal phenomenon: a continuous exploration of new directional dimensions. The internal dimension changes its orientation with each pulsation, confinement redistributes this orientation across its surface, and the particle explores a series of external directions that form a circular or helical trajectory.

Precession, i.e. the slow change in the axis of rotation, arises from the geometry of the confinement. The omnidirectional surface has different areas of tension, the string excites them in a non-uniform way and the axis of rotation moves gradually. This explains the precession of gyroscopes, the stability of the spins and the complex inertial behaviors.

Rectilinear and curved motion

A rectilinear motion corresponds to a stable internal orientation; a curved motion corresponds to an internal orientation in continuous change. A force bends the trajectory by modifying the internal orientation, and the absence of force keeps the internal orientation constant. This principle naturally reproduces the laws of motion without recourse to external axioms.

Directional gravity

Gravity is not a mysterious force or an abstract curvature imposed by an equation. It is a vibratory and directional phenomenon, emerging from the internal structure of particles. It appears when confinements interact through their directional tensions; it is a collective property, resulting from the way in which they deform, overlap and respond to each other.

Vibrational origin of gravity

Each particle has a string that oscillates in a single internal dimension and a confinement that vibrates in all directions. Their interaction creates the directional tension responsible for the mass. When a confinement is massive, its tension becomes important and influences the neighboring confinements. Gravity is the directional voltage gradient created by massive confinements: a massive confinement strongly excites the space around it, this excitation creates a gradient, neighboring confinements orient themselves towards this gradient, and this directional readjustment is perceived as a gravitational attraction.

The directional fluid of lockdowns

Space is not empty. It is filled with confinements, vibrations and possible directions. Each confinement occupies a region of space and influences its neighbors. This network forms a directional fluid: each confinement has a voltage, each tension influences the others, and the voltage gradients create preferential trajectories, which are the gravitational geodesics. Gravity is the collective dynamics of this fluid, which is not material but vibrational, geometrical and directional.

Mass and directional curvature

The more vibrating strings a confinement contains, the higher its directional tension, the more it excites the space around it, the more it creates a gradient, and the greater the gravity it generates.

The curvature of space-time is the deformation of the directional fluid by massive confinements. It is not an abstract mathematical curvature: it is a modification of the possible directions in space.

Geodesics, inertia and light

A geodesic is a preferred direction in the directional fluid, determined by voltage gradients. Particles follow these directions without the need for force: they are not attracted, they follow the directions imposed by the gradients. This mechanism reproduces the free fall, orbits, curved trajectories and gravitational effects observed.

The link with inertia is natural. A directional gradient imposes a preferential orientation, the confinement reorients its surface, the chord reorients its internal dimension, and the particle moves: gravity is a reorientation imposed on the internal dimension by the directional fluid. The same is true for light. A photon has no mass, but it does have an internal direction; when it passes through a directional gradient, its internal direction is reoriented and its external path curves. Light is deflected by gravity because its internal dimension is reoriented by directional fluid, which explains the deflection of light by stars, gravitational lenses, and curvatures observed in space.

Directional Cosmology

The Universe is not defined by a fixed number of dimensions, but by a set of possible directions, which increases with cosmic expansion and is structured by the rotation of the Universe itself. Space is a dynamic directional medium, whose properties emerge from the vibration of confinements, the propagation of free chords, and the global rotation of the cosmos.

The Universe as a rotating directional fluid

The Universe is filled with free strings (photons), confined strings (matter), omnidirectional confinements, directional voltage gradients (gravity), and cosmic rotation dynamics. Space is not empty: it is a rotating directional fluid, composed of vibrations, tensions, and directions.

Cosmic rotation and galactic vortexes

According to the author, the Universe has a slow, but fundamental global rotation. This rotation drives the directional fluid, which, in circular motion, generates areas of turbulence, spirals and vortices. These vortices become spiral galaxies, rotating clusters and helical structures: galaxies are directional vortices created by cosmic rotation.

Rotation also breaks the perfect symmetry of space and creates condensation zones, vacuum zones and filaments. Finally, it produces a cosmic centrifugal effect: matter is pushed outwards, vortices stabilize, galaxies move away from each other and cosmic expansion is reinforced. The expansion of the Universe is thus partly due to this centrifugal effect.

Expansion and creation of directorates

Expansion is not only an increase in distances, but an increase in the number of possible directions. As space expands, new directions appear, so new dimensions emerge, confinements have a larger directional set, and photons can take more trajectories. Dimensions emerge from cosmic expansion and rotation.

Light as a cartographer

In a rotating Universe, photons follow curved geodesics and their trajectory reveals the vortex structure of the cosmos; gravitational lenses become vortex signatures. Light maps the directional vortices of the Universe.

Matter, antimatter and multiple universes

In the same space-time, confinement vibrates in a single way, this vibration sets the laws of physics, and matter and antimatter use the same mode of confinement. They are therefore compatible as long as they share the same directional fluid. If another space-time existed, it could have a different confinement, a different omnidirectional vibration and a different cosmic rotation: another universe would then have different physical laws.

Photons and annihilation

The photon is a free, unconfined string that propagates through space without mass. It retains its frequency, energy, and internal direction, and this release allows it to move at the maximum speed allowed by spacetime. Since mass is a tension created by the interaction between the string and confinement, a free string no longer excites confinement, no tension is generated, and mass disappears.

Annihilation: Disappearance of containment

When a particle encounters its antiparticle, their confinements neutralize each other, their directional voltages cancel each other out, and the internal geometry disappears. This process releases the strings they contained, and these strings, now free, become photons. Annihilation produces photons because it destroys the confinement that created mass. This explains why annihilation produces only light, why the total mass is converted into energy, and why the photons emitted have specific frequencies.

Frequency conservation

During annihilation, the string retains its frequency but loses its confinement; its directional voltage disappears and it becomes a photon. The frequency of the photon corresponds to the internal frequency of the string plus the external frequency of the confinement, converted into pure energy. This principle naturally reproduces the relationship $E = h \cdot \nu$, the conservation of energy and the coherence of the photons emitted.

Photons, dimensions and gravity

A photon propagates in a specific direction, which corresponds to a revealed directional dimension. Photons are the messengers of dimensions: they show gravitational geodesics, galactic vortices, directional voltage gradients, and cosmic rotation. Their deviation by a directional gradient, described above, makes them natural probes of the geometry of space.

Gross Matter Spheres (GDS)

Spheres of dense matter represent a particular state of directional matter: a confinement that contains a large number of vibrating strings and produces an extremely high directional tension.

They are not exotic objects; they are a direct consequence of the previous principles: a string oscillates in a single internal dimension, confinement vibrates in all directions, mass is directional tension, and the more strings there are, the more mass increases. They are the most compact, massive, and stable form of directional matter.

Definition and internal structure

An SMD is a particle or object whose confinement reaches a state of directional saturation. It contains a very high number of strings, extremely intense internal oscillations, maximum directional tension, and a perfectly stable internal geometry. This level of saturation produces very high mass, extreme inertia, remarkable stability, and maximum resistance to internal reorientation.

Its structure is based on three elements. First, a saturated omnidirectional confinement, whose surface is uniformly excited by a large number of strings, which creates a perfectly stable sphere. Second, synchronized oscillating strings: they each vibrate in a single internal dimension, but their oscillations partially synchronize under the effect of directional tension. Finally, a maximum directional tension, the mass of an SMD being proportional to the number of strings, the intensity of their vibration and the directional density of the confinement. An SMD thus represents the maximum mass state for a given confinement.

Extreme mass, stability and gravity

The mass of an SMD comes from the saturated directional tension of the confinement. Its inertia is immense, internal reorientation is very difficult, the movement requires a major directional influence, and the rotation is slow but stable: the internal dimension is highly resistant to modification. Its stability, one of the greatest in the Directional Universe, comes from the saturation of the confinement, the synchronization of the strings, the maximum tension, and the absence of weak areas on the surface. It explains the longevity of massive objects, the coherence of dense structures, and the resistance to directional disturbances.

An SMD generates an extremely intense directional gradient, thus a very high gravity. It strongly deforms the directional fluid, creates very curved geodesics and influences neighboring confinements over large distances. Massive objects observed in the Universe can be interpreted as SMDs: neutron stars, dense stellar nuclei and some extreme compact objects.

Annihilation of an MDS

When an MDS encounters its antiparticle, their saturated confinements neutralize each other, the directional voltage disappears, the strings are released, and an immense amount of photons is produced. This process accounts for extreme light emissions, gamma-ray bursts, and massive directional energy phenomena.

Directional propulsion

Directional propulsion is the direct technological application of the theory. The motion of an object is determined by the reorientation of the internal dimension of its strings, transmitted by confinement. If we manage to manipulate this internal dimension, the directional tension of

confinement and the vibrational geometry of an SMD, it becomes possible to produce propulsion without fuel, without reaction and without mass ejection. It is geometric, vibratory and internal propulsion.

Fundamental principle

An object moves when the internal dimension of its strings changes orientation, confinement reorients its omnidirectional surface, directional tension redistributes, and the object follows the new direction imposed. Propulsion therefore consists of controlling the internal orientation of the strings to impose an external direction. It completely replaces conventional engines: no combustion, no mechanical thrust, no chemical reaction, no mass ejection.

Role of MDS and voltage manipulation

SMDs are essential because they possess extreme directional tension, very high internal inertia, stable vibrational geometry, and saturated confinement. This allows for controlled internal reorientation, directional amplification, and efficient transmission of motion. An SMD acts as a directional heart capable of generating internal thrust; the denser it is, the stronger the tension and the more powerful the propulsion.

Directional tension can be changed in three ways: by varying the internal frequency of the strings, by reorienting the internal dimension to a specific direction, and by synchronizing the strings, which makes the tension consistent and produces a clean thrust. The thrust is thus a consequence of the internal redistribution of the directional tension.

Responsive-free propulsion and bulk weight

Because it relies entirely on the internal dynamics of matter, directional propulsion requires no external reaction: no fuel, no mass ejected, no energy loss through reaction, no mechanical stress. It is quiet, stable, continuous and extremely efficient. By manipulating the directional tension, apparent mass can decrease, inertia can be reduced and internal reorientation becomes easier, allowing for extreme accelerations, rapid changes of direction and unconventional trajectories.

Trajectories and gravitational navigation

The trajectories produced can be straight, curved, helical, or instantly reoriented; they depend only on internal reorientation, directional tension, and containment geometry. An SMD spacecraft can track any directional geodesic. Since gravity is a gradient of directional tension, manipulating the internal tension of an SMD makes it possible to align with a gradient, oppose it, or create an artificial gradient, thus navigating gravitational gradients, bypassing massive objects, following galactic vortexes, and moving through a complex directional fluid.

Rotating mass and experimental protocol

According to the author, a dense, rapidly rotating mass in an accelerator ring, combined with a rotation on itself, could produce a local curvature of space-time sufficient to generate theoretical propulsion. The extreme directional tension of an SMD, amplified by a rapid orbital rotation and then a second time by a rotation on its axis, would deform the directional fluid, and this deformation would be a local curvature of space-time. A double-rotating SMD could thus propel

a spacecraft by exploiting the curvature it creates: the geometry of space-time itself becomes a vector of propulsion.

To test this hypothesis, the protocol plans to place an SMD in an accelerator ring and accelerate it to an extreme orbital speed, to add a rotation on itself to amplify the directional voltage, and then to send photons across the area. The deviation of their trajectory, the modification of the geodesics, the directional variation of the fluid and the presence of an artificial gradient are then measured. The deflection of the photons would serve as a direct indicator of the local curvature produced, and would constitute a first validation of directional propulsion.

Counting the strings

The previous sections have posited the string, confinement, mass and saturation in qualitative terms. The theory is complemented by a quantitative method: string counting. In directional physics, a particle is not defined solely by its mass, charge or spin; it has an internal directional structure, composed of a set of strings, fundamental units of orientation that determine its capacity for interaction, its internal dynamics, its behavior in space and its signature during energetic phenomena.

The particle as a directional system

A particle is neither an abstract point nor a simple field excitation: it is a directional system formed by a set of strings. Each string represents a potential physical orientation, i.e. a direction that the particle can activate to move, interact or emit energy. A particle thus has a maximum number of strings, denoted C_{max} , a number of activated strings, denoted C_{actif} , and a level of directional saturation that depends on its state. This vision introduces an internal granularity that classical physics does not describe.

Strings are directly related to the potential dimensions of the particle. A high number of strings corresponds to a directional richness that allows for internal reorientation, absorption or emission of energy, movement in space, and interaction with other particles. A particle with low stress activates only a fraction of its strings; a particle in intense interaction (collision, excitation, annihilation) mobilizes a large part of its directional potential. When a particle interacts, moves, emits a photon, or undergoes annihilation, it mobilizes part of its strings, and these activated strings define its directional state, orientation density, and saturation level.

The photon as a unit of measurement

When a particle emits a photon, it releases a bunch of directional strings. A photon is a pure directional activation, composed of a fixed number of strings, denoted C_{γ} . This number represents the minimum directional quantity needed to produce a coherent light wave. Each photon emitted corresponds to a string release, and the total number of photons emitted directly measures the mobilized directional structure. The photon thus becomes a directional unit of measurement, revealing the amount of orientation released by an energetic event.

The relationship is linear and forms the basis of the calculation: one photon represents C_{γ} strings, two photons $2 \cdot C_{\gamma}$ strings, and N_{γ} photons $N_{\gamma} \cdot C_{\gamma}$ strings.

Counting during annihilation

Matter/antimatter annihilation is a particularly revealing case. Matter and antimatter release all the directional strings involved in their internal structure, and this release manifests exclusively in the form of photons. If the annihilation produces N_γ photons, the total number of strings released is:

$$C_{\text{annihilation}} = N_\gamma \times C_\gamma$$

This equation gives the total directional quantity mobilized by the event. The number of photons is not only an energetic measure: it is a directional signature of the interaction. A low number of photons indicates a limited directional release, a high number a massive mobilization of the internal strings, and a complete annihilation corresponds to the total release of the strings of the two particles. Light thus becomes a direct indicator of the internal directional structure.

Number of strings in a particle

If annihilation involves two particles of the same nature, for example an electron and a positron, the number of strings of a particle is:

$$C_{\text{particule}} = \frac{C_{\text{annihilation}}}{2}$$

In the general case:

$$C_{\text{particule}} = \frac{N_\gamma \times C_\gamma}{n}$$

where n is the number of particles involved, N_γ the total number of photons emitted, and C_γ the number of strings per photon. This formula makes it possible to estimate the directional structure of a particle from its light signature, and establishes a universal directional metric linking matter, antimatter and light through a common structure.

Directional saturation

Directional saturation is the state in which a particle mobilizes all of its internal strings. It is defined by the ratio:

$$S = \frac{C_{\text{actif}}}{C_{\text{max}}}$$

where C_{actif} is the number of strings currently activated and C_{max} the maximum number of strings available in the particle. This metric describes the directional state of a particle from near-total rest to complete mobilization of its internal structure. $S = 0$ corresponds to a particle at directional rest, $S \approx 1$ to a particle close to its directional maximum, and $S = 1$ to total saturation, where no strings are available for new orientations. Saturation is a real physical state, which relates directional variations to energetic phenomena.

This brings us back to the notion of SMD: a saturated particle behaves like a compressed directional space, analogous to the extreme behaviors observed in regions of high directional density, which is precisely the case of a saturated confinement.

Saturation regimes

In the low regime, $S \ll 1$, the particle activates a small proportion of its strings. It has a high directional freedom, which allows rapid reorientations, low directional density and a high interaction capacity. In the intermediate regime, $S \approx 0.5$, it mobilizes a significant part of its strings: its directional density is increased, its internal dynamics more complex and its sensitivity to external interactions is stronger.

In the high regime, $S \rightarrow 1$, the particle approaches its directional maximum and is in a state of internal tension: reorientations become difficult, directional density reaches extreme levels, and the internal structure stiffens. At full saturation, $S = 1$, all chords are activated and the particle no longer has any direction available for new interactions or reorientations. This state corresponds to maximum directional compression, analogous to the behaviors observed in regions of extreme density.

Saturation and energetic phenomena

When a particle reaches a state of local saturation, it releases strings in the form of photons, which reduces its internal directional voltage: this is the light emission. High-energy collisions mobilize a large number of strings and rapidly increase saturation; the photons emitted are a direct measure of the directional structure solicited. Annihilation corresponds to a total saturation followed by a complete release of the strings, and the number of photons makes it possible to determine the total directional quantity mobilized and the internal structure of the particles involved.

Compression, curvature and black holes

When saturation reaches its maximum, the particle loses its ability to reorient itself: it behaves like a compressed directional space, where potential dimensions are saturated. In regions of high directional density, dimensions stretch, and light, which follows these stretched dimensions, has its trajectory seemingly curved.

Black holes can then be interpreted as regions where potential dimensions are saturated, directional density reaches its maximum, and no free direction is available for light or matter. This interpretation offers a coherent internal geometric view of extreme gravitational phenomena.

Mathematical formalization

Strings, directional space and density

To establish a coherent mathematical basis, each string is represented by an elementary directional vector $\vec{c}^i$, where i is the index of the string, $\vec{c}^i$ belongs to the local directional space of the particle, and its magnitude represents the associated directional intensity. The set of strings of a particle forms an internal directional system:

$$\mathcal{C} = \{ \vec{c}_1, \vec{c}_2, \dots, \vec{c}_{C_{\max}} \}$$

The directional space of the particle is the set of orientations accessible by its strings:

$$\mathcal{D} = \text{span}(\mathcal{C})$$

Its dimension, $\dim(\mathcal{D})$, corresponds to the number of potential dimensions that can be accessed. It is not fixed: it depends on the directional state of the particle and the configuration of its strings.

When a particle interacts, a subset of strings is activated, denoted C_{actif} . The internal dynamics are then described by the vector sum:

$$\vec{D} = \sum_{k=1}^{C_{\text{actif}}} \vec{c}_{i_k}$$

where $\vec{D}$ represents the instantaneous directional density. This density is an indicator of internal voltage and allows saturation to be evaluated. The saturation then extends to a vector formulation:

$$S_v = \frac{\|\vec{D}\|}{\|\vec{D}_{\max}\|}$$

where $\vec{D}_{\max}$ is the maximum directional density when all strings are activated. This formulation describes saturation not only in terms of the amount of strings, but also in terms of directional intensity.

Photon, annihilation and curvature

A photon, the minimum directional activation of C_γ strings, is represented by the vector:

$$\vec{\gamma} = \sum_{j=1}^{C_\gamma} \vec{c}_{\gamma_j}$$

During a light emission, the internal directional variation is:

$$\Delta \vec{D} = -\vec{\gamma}$$

which expresses the release of strings in the form of light. For an annihilation producing N_γ photons, $C_{\text{annihilation}} = N_\gamma \times C_\gamma$ and the total directional variation is:

$$\Delta \vec{D}_{\text{total}} = - \sum_{k=1}^{N_\gamma} \vec{\gamma}_k$$

This equation describes the complete disappearance of the internal directional structure of the particles involved.

Directional curvature is defined as the spatial variation of directional density:

$$\kappa = \|\nabla \vec{D}\|$$

It represents the stretching of potential dimensions, the local directional deformation and the path followed by light in regions of high density. Near black holes, it reaches maximum values, corresponding to total directional saturation.

The fundamental equations of directional physics can be summarized as follows: the internal structure $C = \{\vec{c}_i\}$, the directional density $D^\vec{c} = \sum \vec{c}_i \cdot \vec{c}_i$, the saturation $S = C_{\text{actif}} / C_{\text{max}}$, the photon $\vec{\gamma} = \sum \vec{c}_i \cdot \vec{c}_i$, the annihilation $C_{\text{annihilation}} = N_\gamma \cdot C_\gamma$ and the curvature $\kappa = \|\nabla \vec{D}\|$.

Light Signatures and Applications

Light is a direct indicator of the internal structure of the particles. Each photon emitted corresponds to the release of a set of strings, which establishes a quantitative relationship between the internal dynamics of a particle, its level of saturation, and the amount of strings mobilized during an energetic event. Photons are directional tracers: they reveal the amount of strings released, the internal directional voltage, the local directional density, and the nature of the event. Each photon carries a portion of the initial directional structure, so the spectrum analysis provides information on the frequency of string activation, the internal directional distribution, the local saturation, and the directional geometry of the surrounding space.

Laboratory applications

Annihilation is the most revealing phenomenon: the relationship $C_{\text{annihilation}} = N_\gamma \times C_\gamma$ allows us to estimate the directional structure of the particles involved. In high-energy collisions, the analysis of the spectrum of complex light emissions determines the level of saturation reached, the amount of strings mobilized and the directional redistribution after the collision. The internal transitions of a particle correspond to directional rearrangements; the photons emitted reveal the internal directional structure, the local voltage and the dynamics of the activated strings.

Astrophysical signatures

Cosmic phenomena are environments where the directional density reaches extreme levels. Stars emit photons in massive quantities, which correspond to a continuous release of strings and reveal the internal saturation of plasmas, the directional tension of stellar layers, and the internal dynamics of ionized particles. The jets emitted by the active nuclei of galaxies exhibit an intense

light signature, which reflects an extreme mobilization of the inner strings of accelerated particles. Near black holes, saturation is at its highest, and light bending along the stretched dimensions is a direct signature of local geometry.

Directional black holes

On a cosmic scale, space is a set of potential dimensions defined by the internal orientations of particles and fields. When the directional density reaches extreme levels, these dimensions become saturated: no additional direction is available, the strings are fully mobilized, and the internal geometry of space contracts. This is the basis for the directional interpretation of black holes.

Definition and dimensional stretching

A black hole is a region where the local saturation is $S_{\text{local}} = 1$. The potential dimensions are compressed, the directional density is maximum, no reorientation is possible and the light has no free direction to escape. It is not a mathematical singularity, but a saturated geometry whose strings are fully mobilized.

Near a black hole, the dimensions are not only saturated, they are stretched, which is manifested by the spatial variation in the directional density $\kappa = \|\nabla \vec{D}\|$. Light follows these stretched dimensions and its path appears curved. The light deflection observed around black holes therefore corresponds to a distorted directional geometry, rather than a simple curvature of space-time.

Directional horizon and internal dynamics

The event horizon is the boundary where $S_{\text{local}} \rightarrow 1$. Outside, free directions remain, and light can still reorient itself; inside, all potential dimensions are saturated, and no direction is available for outgoing movement. The horizon becomes a directional transition rather than a classical geometric boundary.

In a saturated region, the strings are fully mobilized, the density reaches its maximum, the internal geometry stiffens, and reorientations become impossible. The internal dynamics are described by $\vec{D}_{\text{saturé}} = \vec{D}_{\text{max}}$, the maximum density that constitutes the ground state of a directional black hole.

Evaporation and influence on matter

When a saturated region loses directional density, it releases strings in the form of photons, with $\Delta \vec{D} = -\gamma \vec{D}$. This gradual release is interpreted as directional evaporation, analogous to the evaporation of black holes in thermal models, but based on internal string dynamics.

A saturated geometry influences the surrounding material through directional compression, stretching of potential dimensions, local increase in curvature, and modification of light paths. Nearby particles see their own saturation increase, which can lead to light emissions, forced reorientations, and directional internal transitions.

Cosmic role

Saturated regions influence the directional distribution of particles and contribute to the formation of galactic disks, relativistic jets, and spiral structures. Black holes act as directional regulators, absorbing excess strings and redistributing directional density through light emission. Light bursts, jets, and high-energy phenomena are interpreted as massive releases of strings in regions close to saturation.

The Directional Model of the Universe

The model considers the Universe as a dynamic structure composed of potential dimensions, defined by the internal orientations of particles, fields and regions of directional density. It is not a static space but a rotating system, where the potential dimensions are continually rearranged, where the directional density varies according to the regions and where strings determine the internal dynamics of matter and light.

Cosmic rotation and directional distribution

Cosmic rotation is a global orientation of the Universe, resulting from the directional distribution of large-scale strings. It is not a classical mechanical rotation, but a directional rotation: the potential dimensions follow a dominant orientation, the overall directional density imposes a coherent structure, and light trajectories and material movements reflect this orientation. It explains the alignment of large-scale structures, the directional coherence of cosmic filaments, and the internal dynamics of galaxy clusters.

The Universe has a non-uniform distribution of directional density, described by $D^{\rightarrow}_{\text{cosmique}}(x, y, z)$, the large-scale average directional density. High-density regions correspond to galaxy clusters, areas of high energy activity, and regions near saturated structures; low-density regions correspond to cosmic voids, areas of low light activity, and regions where potential dimensions are widely available. Cosmic potential dimensions form space $D_{\text{cosmique}} = \text{span}(C_{\text{univers}})$, where C_{univers} is the set of global strings; its dimension, $\dim(D_{\text{cosmique}})$, describes the directional richness of the Universe and evolves with global directional density and major energetic phenomena.

Cosmological structures

Saturated regions, such as directional black holes, act as directional compression centers, density regulators, and anchor points for galactic structures; they impose directional density gradients, dimensional stretches, and large-scale directional curvatures. Cosmological structures then emerge naturally. Filaments are regions where directional density is oriented in a dominant direction, a result of large-scale string alignment. Clusters form in areas of high directional density, where potential dimensions are partially saturated. Voids are regions of low directional density, which offer a high availability of potential dimensions.

Expansion as directional redistribution

Cosmic expansion is interpreted as a directional redistribution: strings reorganize, potential dimensions expand, average directional density decreases, and light reveals the evolution of

internal geometry. Light emitted from distant galaxies reveals string dynamics on a cosmic scale, and the distribution of photons in the Universe makes it possible to estimate the overall directional density, the tension of dense regions, and the internal structure of high-energy areas. This interpretation offers a consistent alternative to classical metric models.

Conclusion

All of the physics emerges from the way a string vibrates in a single internal dimension and how that vibration interacts with omnidirectional confinement. This interaction creates mass (directional tension), inertia (resistance to reorientation), motion (internal reorientation), gravity (tension gradient), dimensions (possible directions), cosmology (expansion and rotation of directional fluid), light (free string revealing directions), and SMDs (extreme states of directional saturation).

String counting and saturation give this edifice its metric: the photon, a minimal directional activation, measures the quantity of strings mobilized during an energetic event, and the ratio $S = C_{\text{actif}} / C_{\text{max}}$ quantifies the directional state of a particle as well as a region of space. Matter is not a solid block, but a vibrating string enclosed in a directional sphere; gravity is not a mysterious force, but a gradient of tension; light is a free vibration whose trajectory reveals the dimensions of the Universe. Matter, light, motion, gravity, cosmology and extreme states of density are thus brought together in a single framework, where all physical phenomena are a consequence of direction, and where direction is the true structure of the Universe.

This theory paves the way for experimental research: measurement of local curvature via photons, study of MDS in accelerator rings, exploration of directional gradients, analysis of cosmological vortices and reading of the light signatures of annihilations and collisions. It proposes a new way of understanding the geometry of space, the dynamics of matter, the nature of light, the origin of gravity and the structure of the cosmos.

Chapter 3 — Exponential Division and Dimensions

Introduction

The previous chapters have posited the idea that space is not a passive setting, but a structure endowed with directions. This chapter gives this idea its geometric tool and its most radical consequence. The tool is exponential division, a new operation applied to a spherical space. The consequence is a complete redefinition of the notion of dimension: a dimension is no longer an axis, but a direction, and the dimensions of space are calculated from a point by subdividing the sphere that surrounds it.

The reasoning progresses in seven stages. We will first define exponential division and distinguish it from known mathematical operations, then we will describe its internal mechanics and the calculation of directions from a point. We will then give the axiomatic formulation, which introduces directional density and saturation. We will then establish the identification of

directions and dimensions, before describing the exponential, potential and dynamic dimensions, and finally showing how light, through its behavior, reveals these dimensions.

1. Exponential division

1.1. A new geometric operation

Exponential division is an entirely new geometric operation, applied to a spherical space. It does not come from any branch of classical mathematics and has no equivalent among the traditional operations such as division, exponentiation or fractal subdivision. It introduces a conceptual break that can be summarized in a formula: divide a space to increase its complexity.

In existing mathematics, dividing a space consists of cutting it into smaller parts, according to a linear or proportional rule. Exponentiation, on the other hand, produces rapid growth, but it applies to numerical values rather than volumes. No mathematical structure combines these two mechanisms into a single coherent operation. Exponential division is precisely this combination: a growth geometry, a volumetric structure, an internal mechanics where each division results in an expansion of the structure rather than a reduction.

When a sphere is subjected to exponential division, it is first divided into a set of elementary regions. Each of these regions is subdivided in turn, and each subdivision produces an increasing number of new divisions. The total growth follows an exponential progression, and the internal space gradually becomes saturated according to a geometric logic. The sphere is therefore not simply cut up: it is multiplied geometrically.

1.2. General definition

Each initial division becomes a point of origin for a new set of divisions, which creates an internal expansion as the game progresses:

$$n, n^2, n^3, n^4, \dots$$

where n represents the number of regions created by the initial division. This growth is not numerical: it is volumetric, directional, and structural. Exponential division transforms a sphere into a space saturated with subdivisions, the density of which increases with each step.

1.3. Distinction with classical mathematical divisions

To measure the novelty of the operation, it is necessary to confront it with the three mechanisms to which it seems to be close. Classical division reduces, splits, and separates into smaller parts: whether it is a question of numbers or volumes, it is always reductive, as expressed by the relations $1/2 < 1$ and $V/n < V$. A sphere divided into two hemispheres remains a sphere reduced to two parts, and classical division never increases the internal complexity of a space.

Exponentiation is the opposite operation in its effect: it increases, as shown by the inequalities $a^2 > a$ and $a^3 > a^2$. But it produces this rapid growth only on numerical values, never on volumes or geometric structures. It does not divide, it multiplies.

Fractals introduce repeated subdivision, but they rely on self-similarity and follow a fixed rule. They do not produce exponential growth in the number of subdivisions and do not saturate a spherical volume. A fractal is a shape, not a volumetric growth mechanic.

Exponential division thus brings together three mechanisms that have never been combined before: a division, i.e. the fragmentation of a space; an exponentiation, i.e. the increase in the number of subdivisions; and a volumetric saturation, i.e. the internal filling of the sphere. In classical mathematics, dividing is equivalent to reducing, exponentiation to increase, fractalizing to repeat. Here, dividing is used to increase: the sphere fragments, each fragment redivides, each redivision produces an expansion and the internal structure becomes denser. No traditional mathematical theory proposes such a mechanism.

2. Internal Structure and Properties

2.1. The sphere as an initial space

Exponential division always begins with spherical space. The sphere is chosen for three reasons: it has no edges, it offers perfect continuity and it allows for uniform subdivision in all directions. It thus constitutes a neutral volume, without a preferred orientation, ideal for coherent geometric growth.

2.2. From the central point to saturation

The process unfolds in precise and reproducible steps. It begins with a single point, denoted p , located in the center of the sphere. This point is the origin of directions, subdivisions, and internal growth, and it becomes the absolute reference for all future divisions. Around it, a sphere of radius r , isotropic, continuous and homogeneous, that is, without a preferred direction, without a geometric break and of the same density everywhere, is defined.

The first division divides the sphere into n elementary regions, a number that forms the basis of the exponential division. Each region has its own volume, is independent of the others, and can subdivide in turn. Each region is then subdivided into n new regions, so that the sphere contains n^2 regions. This subdivision is not linear but multiplicative, because each region becomes the point of origin of a new series of divisions. The process is repeated: after k steps, the sphere contains n^k regions, and the growth is strictly exponential.

As subdivisions multiply, the internal density increases, the regions become smaller, and the space gradually fills up. After a sufficient number of steps, the internal space is fully occupied and the structure reaches a state of saturation. This saturation is not a physical filling, but a geometric densification. The sphere then possesses maximum internal density, coherent structure, and irreversible complexity: it has become a geometrically complete space, a rich directional space.

2.3. Geometric properties

Exponential division does not produce geometric chaos, because it obeys an internal logic. Each subdivision respects the previous structure, the growth is uniform in all directions, and the density

increases without deformation of the volume. This internal coherence ensures that the sphere remains a stable space despite the multiplication of subdivisions.

Seven properties characterize the operation. The first is internal growth: the complexity of a space increases instead of decreasing, whereas in a classical division the structure becomes simpler. The second is volumetric multiplication, by which a subdivision is transformed into a geometric expansion according to the progression $n, n^2, n^3, n^4, \dots$. The third is directional uniformity: the division respects the natural symmetry of the sphere, no direction is favored and the internal growth is isotropic. The fourth is progressive saturation, which is a geometric occupation of the volume and not a material filling.

The fifth property is a non-self-similar fractality. The structure is fractal in the sense that the subdivision is repeated, the complexity increases with each step, and the density increases according to a regular logic. However, it is not based on the strict self-similarity of classical fractals: each subdivision is coherent, but not identical to the previous one. The exponential division thus creates a non-self-similar fractal, a new geometric property.

The sixth is the conservation of the overall form. Despite internal multiplication, the sphere retains its radius, its surface and its shape, because the operation acts inside the volume without modifying the external geometry. The sphere remains a sphere, but becomes a complex internal space. The seventh is irreversibility: the structure produced is increasingly complex, dense and difficult to decompose, to the point that it is impossible to find the initial structure from an advanced state.

3. Calculating directions from a point

3.1. The six elementary directions

The most fruitful property of exponential division is that it allows us to calculate the number of possible directions from a specific point in space, by defining a sphere around that point. The central point p is then the directional origin: all possible directions are defined relative to it. The sphere of radius r built around p represents the set of theoretically accessible directions from that point, and it is ideal for this role because it is isotropic, favors no orientation, and uniformly covers the surrounding space. Each subdivision of the sphere corresponds to a potential direction.

The elementary directions are defined by the three fundamental axes of space: $+X, -X, +Y, -Y, +Z,$ and $-Z$. These six directions constitute the primary orientations accessible from the central point. They form the initial basis of the exponential division, so that $n = 6$: before any subdivision, the sphere contains six elementary directions.

3.2. Multiplication of directorates

When each elementary direction is subdivided into six new directions, the total number of directions becomes $6^2 = 36$. With each step, the sphere gains new directions, the directional accuracy increases, and the angular resolution becomes finer. After k steps, we get:

6^k directions possibles

The growth is strictly exponential, and the directional resolution is directly proportional to the depth of subdivision: the more steps increase, the finer the directions, the more detailed the space, and the more the sphere represents a complete set of directions.

When the sphere reaches the state of volumetric saturation, all possible directions are defined, the space around the point is completely covered, and no orientation is left undivided. The sphere then becomes a complete catalog of directions. An exponentially subdivided sphere is therefore a geometric tool for calculating all possible directions from a given point, starting from the six elementary directions defined by the X, Y, and Z axes.

4. Axiomatic Formulation

4.1. Directional Space and Primary Directions

Exponential division admits of an axiomatic definition, where it appears as an internal directional operation. Let S be a compact geometric object with a central point C . We associate it with an internal directional space:

$$\mathcal{D}(S) \subset T_C(S)$$

where $T_C(S)$ denotes the tangent space in C . The elements of $\mathcal{D}(S)$ are internal directional vectors, specific to the geometry of S . This space does not represent an external angular discretization, but a directional structure intrinsic to the domain; it has a magnitude induced by the tangential structure, which allows the definition of normalized vectors, and it does not depend on any global coordinate system.

Directional space contains a finite set of primary directions:

$$D_0 = \{d_1, d_2, \dots, d_n\} \subset \mathcal{D}(S)$$

where n depends on the geometry of S . For a sphere, $n = 6$, which corresponds to the orthogonal internal directions; for a cube, $n = 8$, directions connecting the center to the vertices; for a tetrahedron, $n = 4$. These directions are not coordinate axes, but fundamental internal vectors, chosen to reflect the internal symmetry of the domain. Their number $|D_0| = n$ determines the exponential growth factor.

4.2. Generation of secondary directorates

For each direction d belonging to D_k , we define a set of secondary directions:

$$\Delta(d) = \{f(d, d_i) \mid d_i \in D_0\}$$

where $f : D(S) \times D(S) \rightarrow D(S)$ is an internal directional map given by:

$$f(d, d_i) = \frac{d + \lambda d_i}{\|d + \lambda d_i\|}$$

where $\lambda > 0$ constant. This operator combines an existing direction d with a primary direction d_i , and then normalizes the result so that the new direction belongs to $D(S)$. Each secondary direction is thus a normalized internal deviation from the direction from which it originated. The operator is designed to preserve the internal directional structure while allowing for controlled growth of complexity.

Since the set $\Delta(d)$ has a constant cardinal equal to $|D_0|$, each direction generates exactly the same number of secondary directions, which ensures uniform growth. Normalization further ensures that for any d belonging to D_k and any d' belonging to $\Delta(d)$, we have $\|d'\| = 1$. The directional structure thus remains confined to the unit tangent space, which avoids any geometric divergence or loss of internal coherence.

4.3. Exponential recursion

Exponential division is defined recursively by:

$$D_{k+1} = \bigcup_{d \in D_k} \Delta(d)$$

with $|\Delta(d)| = |D_0|$. The result is :

$$|D_k| = |D_0|^k$$

This growth is not volumetric: it is directional. The D_k sets form a hierarchy of directional levels, and the transition from D_k to D_{k+1} corresponds to an exponential increase in the number of available directions. This growth distinguishes exponential division from classical subdivisions, whose growth is generally linear or polynomially bounded.

This formulation should be linked to the geometric presentation of the previous sections. The progression n , n^2 , n^3 described the progressive filling of the sphere; the axiomatic definition isolates its essential content, namely the number of internal directions, which increases exponentially while the volume of the object remains constant. In both cases, the result is the same: the sphere retains its overall shape, and only its internal richness increases.

4.4. Directional density and saturation

The geometric volume of S remains constant during the subdivision: $\text{Vol}(S) = \text{constant}$. We then define the internal directional density:

$$\rho_k = \frac{|D_k|}{\text{Vol}(S)} = \frac{|D_0|^k}{\text{Vol}(S)}$$

This density increases exponentially with k . It distinguishes the exponential dimensions of classical volumetric subdivisions, where the density remains constant, and fractal structures, where the volume decreases.

However, growth cannot continue indefinitely. It is assumed that there is a minimum directional granularity $\delta > 0$, which represents the smallest internal directional unit that a geometric domain can distinguish. It can be interpreted as an internal resolution limit, a geometric constraint, or a physical property associated with the domain structure, and it imposes a lower bound on the distance between two distinct vectors of $D(S)$:

$$\|d - d'\| \geq \delta$$

The minimum granularity imposes a maximum density $\rho_{\max} = 1/\delta$. Directional saturation is reached when $\rho_k \geq \rho_{\max}$, i.e. when $|D_0|k / \text{Vol}(S) \geq 1/\delta$. The maximum level of subdivision is then:

$$k_{\max} = \left\lfloor \log_{|D_0|} \frac{\text{Vol}(S)}{\delta} \right\rfloor$$

Beyond $k_{\max}$, no new internal management can be added.

Saturation corresponds to a state where the internal directional space is completely filled: each possible direction, compatible with the minimum granularity, is represented in $D_{\{k_{\max}\}}$. No new direction can be generated, the density can no longer increase, and the hierarchy stops growing, which marks the end of the exponential progression. The volume remains constant even at saturation, because it is a purely directional phenomenon. The structural limit thus imposed on internal complexity depends on only three quantities: the cardinality of D_0 , the volume of the domain, and the minimum directional granularity. Saturation represents a point of internal equilibrium, the transition between a phase of exponential growth and a phase of directional stability.

5. Directions and dimensions

5.1. A Directorate Constitutes a Dimension

In the author's theory, a direction is not only an orientation in space: a direction constitutes a dimension. The principle is as follows: if a direction is a possibility of displacement, then each direction represents a real, accessible, and definable dimension. Where classical vision sees dimension as an abstract axis, directional vision sees it as a physical, measurable, and calculable direction.

Thus, $+X$, $-X$, $+Y$, $-Y$, $+Z$, and $-Z$ are each one dimension, and the six elementary directions are the six primary dimensions accessible from a point. Exponential division then increases the number of possible directions, and thus the number of derived dimensions. After k steps:

$$6^k \text{ directions possibles} = 6^k \text{ dimensions possibles}$$

Exponential division then becomes a geometric tool for calculating the real dimensions of space, starting from a point and subdividing the sphere around it. The chain of reasoning is simple: a dimension is a direction, a direction is a possibility of displacement, a subdivided sphere is a catalog of directions, and a sphere subdivided exponentially is therefore a catalog of dimensions. The method makes it possible to define primary dimensions, to derive secondary dimensions, to calculate tertiary dimensions, to saturate directional space, and to reveal the real dimensions accessible to light.

5.2. The relativity of dimensions according to the observer

A dimension is not absolute: it depends on the orientation of the observer. When two people look in different directions, the depth of one is not the depth of the other, and the dimension "ahead" changes according to the orientation. If we look ahead, the depth is in that direction; if someone looks at us in profile, his depth is perpendicular to ours. What is one dimension for one observer becomes another dimension for another.

Dimensions are therefore relative, because they depend on the direction in which the observer looks. Dimension is not a universal axis: it is a local direction defined by the observer.

5.3. The analogy of the cube

The cube analogy specifies how a direction becomes a dimension. Consider a cube defined in a local frame of reference R_0 . Its three orthogonal axes (X, Y, Z) represent fixed directions in this frame of reference. But R_0 is not isolated: it is included in a hierarchy of dynamic frames of reference, each with its own rotation or translation:

$$R_0 \subset R_1 \subset R_2 \subset R_3 \subset R_4$$

Here R_1 is the Earth's rotation, R_2 the orbital revolution, R_3 the galactic rotation, and R_4 the displacement of the local group. A cube placed in a room seems to define three stable directions, but it is driven by the rotation of the Earth, by its orbit around the Sun, by the motion of the solar system in the galaxy, and by the movement of the galaxy itself in the cosmos. Each frame of reference imposes a directional transformation on the axes of the cube.

In R_0 , a direction is represented by a unit vector d_0 . In a higher frame of reference R_i , this vector becomes:

$$d_i(t) = T_i(t) d_0$$

where $T_i(t)$ is a time-dependent matrix of rotation or translation. A fixed direction in R_0 becomes a variable direction in R_i , and it acquires a dynamic:

$$\frac{d(d_i)}{dt} \neq 0$$

This criterion is fundamental: a dynamic direction is a dimension. We can then state the resulting definition:

$$\text{Dimension} = \text{Direction} + \text{Dynamic}$$

A dimension is not a pre-existing entity. Any direction is a dimensional candidate and can become a dimension as soon as it is subjected to a higher movement; the number of possible dimensions is equal to the number of possible directions. The set of possible directions thus constitutes the set of potential dimensions. In a rotating universe, this set is virtually infinite, because each direction can be reoriented, amplified, or transformed by cosmological vortexes.

Planetary, stellar, galactic, and supragalactic vortices impose a directional dynamic that structures space: dimensions emerge from directions, and directions emerge from motions. The cube analogy shows that dimensions are not static, that they are generated by the superposition of frames of reference, that each direction is a potential dimension, and that the geometry of the universe is a dynamic directional field. Dimensions are not fixed axes, but living directions shaped by cosmological vortexes.

6. Potential dimensions

6.1. A dimension is a transported direction

The classical conception of dimensions is based on a static vision of space: three fixed, immutable axes, defining a universal geometric framework. Inherited from Newtonian physics and extended into relativity, this representation gives the illusion of a rigid structure, independent of cosmic motion. However, if the Universe has a global rotation, the dimensions associated with the cube, those we believe to be fixed, are in reality in perpetual motion. A dimension is therefore not a static axis: it is a direction transported, continuously reoriented by cosmological dynamics.

In a directional approach, a dimension is a direction of freedom. A direction is a vector oriented in space, and its validity depends on the frame of reference in which it is observed. Unlike the immutable axes of Euclidean geometry, a physical direction is influenced by the rotation of the body that carries it, by orbital motions, by galactic displacements, by the local density of matter, by the internal structure of space and by the fundamental granularity, the Planck length. A dimension is thus a dynamic orientation, continuously re-evaluated by cosmological interactions.

A frame of reference is never stationary: it is transported by the Earth's rotation, its orbit around the Sun, the motion of the solar system in the galaxy, the motion of the galaxy in the Universe, and potentially by the global rotation of the Universe itself. Each movement reorients the internal directions of the frame of reference, and the classical dimensions are only local approximations of an ever-changing set of directions. Mathematical dimensions (3D, 4D, 10D, 11D) are abstract constructs useful for modeling, but they do not take into account the granularity of space, cosmic dynamics, local variations in density, internal directional structures, or the actual ability of space to generate orientations.

Three principles are then the basis of the directional definition: a dimension is a direction, not an axis; a direction is dynamic, not static; the number of directions depends on the internal capacity of the space, and not on an imposed mathematical framework. A dimension is thus defined as a direction accessible from a point, determined by the internal structure of the space and by its minimum granularity.

6.2. The sphere as a directional space

To quantify these directions, an internal space capable of containing them is required, and the sphere imposes itself by its perfect symmetry, isotropy, and unique center. Perfect symmetry ensures a uniform distribution of directions, since each point on the surface is equidistant from the center. Isotropy reflects the absence of geometric bias in the fundamental space. The single center corresponds to the physical definition of a directional origin.

The center defines a local frame of reference, allows directions to be measured as oriented vectors, serves as an anchor for exponential subdivision, and represents the position of a particle, a point in space, or a directional element. In directional physics, it is not a simple mathematical point: it is a directional node, a place where space unfolds in multiple orientations. The surface of the sphere is the set of directions accessible from the center. Each point on the surface corresponds to a unique orientation, the surface is a catalog of directions, and the density of points it carries determines the directional capacity of space.

The sphere can represent the internal space of a particle, a point in physical space, a directional element in a torus, a unit of structure in a photonic model, or a node in a directional network. It is universal because it does not depend on the frame of reference, external geometry, or cosmological motions: it represents internal space as it is, independent of the observer. However, its directions are not static, because they are reoriented by the Earth's rotation, orbital motions, galactic displacements, and global cosmological dynamics. The sphere is a living directional space, a bridge between internal geometry, external dynamics, and the directional definition of dimensions.

6.3. Subdivision up to Planck length

The sphere provides the geometric framework, the exponential subdivision provides the granularity, and the Planck length provides the minimum limit. Subdivision consists of dividing the surface of the sphere into smaller and smaller segments, according to a constant reduction factor, with the number of subdivisions increasing exponentially at each step. It respects the symmetry of the sphere, guarantees a uniform distribution of directions, and allows the minimum granularity to be gradually approached. Each subdivision represents a potential direction, a distinct orientation accessible from the center. It is not an arbitrary division: it is an increase in directional resolution, which transforms the surface into a set of oriented vectors.

The subdivision must stop at a physical limit, the Planck length, considered to be the smallest significant unit of distance in the Universe. Here it plays the role of the directional pixel of space: it defines the ultimate granularity of the sphere, beyond which no physical subdivision is possible.

This gives the finest possible subdivision, the maximum directional density and the total number of directions accessible from a point, a finite but extremely large set that depends on the radius of the sphere, its total area, the level of subdivision and the granularity imposed by the Planck length.

This construction has a physical significance: space is not continuous but granularized, directions are not infinite but quantifiable, and internal geometry is related to the fundamental structure of the Universe. The sphere becomes a discrete directional space, where each orientation corresponds to a fundamental unit of structure.

6.4. Mathematical definition

Consider a sphere of radius R centered at a point O . Its total area is:

$$S(R) = 4\pi R^2$$

Each point on this surface corresponds to a direction from O , and $S(R)$ is therefore the set of possible directions. We introduce the Planck length ℓ_P as the minimum scale of significant distance and define a minimum area:

$$a_{\min} = \ell_P^2$$

This area is the smallest possible directional pixel on the surface of the sphere: no physical subdivision can produce a smaller elementary surface. The maximum number of distinct surface elements, each associated with a unique direction, is then:

$$N_{\text{pot}}(R) = \frac{S(R)}{a_{\min}} = \frac{4\pi R^2}{\ell_P^2}$$

This number is the number of distinct directions accessible from the center O , at Planck granularity.

Subdivision can be read as an exponential refinement. Suppose that at step $n = 0$ the surface is divided into N_0 elements and that at each step each element is divided into k subelements, e.g. $k = 2$ for a binary division. The number of elements in step n is:

$$N_n = N_0 k^n$$

The subdivision continues until the average area of an element reaches the minimum area, $S(R)/N_n \approx a_{\min}$, resulting in $N_n \approx S(R)/a_{\min} = 4\pi R^2/\ell_P^2$. The exponential process therefore converges to the same maximum number of directions:

$$N_{\text{pot}}(R) = \lim_{n \rightarrow n_{\max}} N_n = \frac{4\pi R^2}{\ell_P^2}$$

We can then formulate the definition: the potential dimensions associated with a sphere of radius R are the maximum number of distinct directions accessible from its center, obtained by subdividing its surface to the minimum area $a_{\min} = l_P^2$. Formally:

$$D_{\text{pot}}(R) = \frac{4\pi R^2}{\ell_P^2}$$

This number is an integer, or very close to an integer after rounding, which represents the maximum directional capacity of the space around the point O .

6.5. Characteristics of potential dimensions

Potential dimensions are discrete, their number being finite and determined by the granularity of space. They are isotropic, with no direction being preferred in the initial sphere. They are dynamic, since cosmological movements reorient them. They are internal, because they describe the directional capacity of a point independently of the external frame of reference, and fundamental, because they emerge from the deepest structure of space. Unlike mathematical dimensions, they are not imposed by a model: they emerge from the internal geometry of space.

There are three types of dimensions. Classical dimensions (3D, 4D) are static, abstract geometric axes that are independent of granularity. Potential dimensions are the set of directions accessible from a point, determined by the maximum subdivision of the sphere; they represent the total directional capacity of space. Effective dimensions, denoted N_{eff} , are the subset of potential dimensions actually used by a given physical phenomenon, according to local density, energy, internal structure, cosmic motion, and directional context:

$$N_{\text{eff}} \leq D_{\text{pot}}(R)$$

Potential dimensions define what is possible, effective dimensions what is used. This distinction helps to understand why certain phenomena seem to emerge, disappear, or transform: they reflect variations in the use of effective dimensions, which in turn come from potential dimensions.

6.6. Applications

The potential dimensions first allow us to model the particles as directional spaces. A particle is no longer an abstract point, but a directional sphere with a radius R , endowed with an internal ability to direct its interactions, whose directional richness is $D_{\text{pot}}(R)$. For a particle whose radius is equal to its Compton length λ_C , we obtain:

$$D_{\text{pot}}(\lambda_C) = \frac{4\pi\lambda_C^2}{\ell_P^2}$$

extremely high number that represents the fundamental directions accessible to the particle.

We then define the directional activation coefficient:

$$\alpha = \frac{N_{\text{eff}}}{D_{\text{pot}}}$$

where $\alpha = 1$ means that all directions are accessible and $\alpha < 1$ that space is constrained. Physical states are then described by variations in α : a free state corresponds to $\alpha \approx 1$, a constrained state to $\alpha < 1$ and a saturated state to $\alpha \ll 1$. This tool makes it possible to model state transitions, quantum phenomena, emergent behaviors and propagation limits.

In discrete space, a trajectory is no longer a continuous line: it is a sequence of fundamental directions $\{d_1, d_2, d_3, \dots, d_n\}$, where each d_i belongs to the set of directions of $D_{\text{pot}}(R)$. The trajectories of particles are directional transitions, influenced by the internal structure of space.

Light is a directional phenomenon whose propagation depends on the local directional density:

$$v = c \alpha$$

where c is the maximum velocity in isotropic space. In free space, $\alpha = 1$ and light reaches c ; in saturated space, $\alpha < 1$ and it slows down. Diffraction becomes a directional redistribution, interference a superposition of directions, polarization becomes directional selection, and dispersion becomes a variation of α according to frequency.

Finally, if the Universe has a global rotation Ω , the internal directions are reoriented according to:

$$\Delta\theta = \Omega t$$

this implies an evolution of the number of effective dimensions over time, a reorientation of potential directions, and cosmological directional dynamics. Potential dimensions therefore describe not only what space is, but what it can become under the effect of cosmological dynamics. They replace abstract dimensions with a real, quantifiable, and physically coherent directional structure, which integrates with directional cores, explains confined string dynamics, and provides a framework for directional photonics.

7. Exponential dimensions

7.1. A Directional Level

In directional geometry, the structure of a domain is determined not only by its spatial extent, but by the number of internal directions it is able to support. As the domain increases in scale, its internal directional capacity increases, revealing higher-order levels that remain inaccessible to small scales. These levels, generated by the recursive operator of exponential division, are the exponential dimensions.

An exponential dimension is a level in the hierarchy of internal directional sets: the one that corresponds to a given set D_k . Each level is defined by a directional space whose cardinality grows exponentially with the order of subdivision, while the geometric volume remains constant.

This dimensionality is not based on classical spatial axes or external coordinates: the dimension emerges from the internal directional density of the domain, which increases as it expands and undergoes successive refinements. The dimension is no longer a spatial measure, but a measure of internal directional density. It establishes a hierarchy of directional degrees of freedom and clarifies the relationship between scale and internal structure.

7.2. Saturated black holes

A black hole can be modeled as a compact geometric domain S whose internal directional density has reached the maximum value $\rho_{\max} = 1/\delta$. The directional set $D_{\{k_{\max}\}}$ satisfies this $|D_{\{k_{\max}\}}| = |D_0|^{\wedge\{k_{\max}\}}$, and no new direction can be added without violating the minimum granularity. The black hole is a saturated directional space, where the hierarchy has reached its maximum level.

When it absorbs matter or energy, its internal domain is disturbed and its effective volume increases: $\text{Vol}(S) \rightarrow \text{Vol}(S) + \Delta V$. The directional density then temporarily decreases:

$$\rho = \frac{|D_{k_{\max}}|}{\text{Vol}(S) + \Delta V} < \rho_{\max}$$

The black hole stops being saturated, and a directional margin appears. This decrease in density triggers an internal reconstitution: the domain generates new directions by exponential division, $D_{\{k_{\max}+1\}} = \bigcup \Delta(d)$, until it finds $\rho = \rho_{\max}$. Saturation is restored, but at a higher directional level.

This reconstitution cannot occur without a change in the external geometry: the increase in the number of internal directions leads to an increase in the size of the saturated domain, and the radius R must adjust according to $R \rightarrow R' > R$. The growth of a black hole is therefore a directional compensation mechanism. The absorption of matter increases the internal volume, which reduces the directional density; the internal structure generates new directions to restore saturation, which imposes an increase in the radius. The black hole reaches a new equilibrium, characterized by maximum density, extended hierarchy, increased radius and stabilized structure, which any new absorption will disrupt, resulting in a similar cycle of desaturation, reconstitution and expansion. There is nothing mysterious or paradoxical about this growth: it stems from the properties of exponential dimensions and can be explained without resorting to singularities or undefined mechanisms.

7.3. An expanding universe

In an expanding universe, the volume of an S domain evolves according to $\text{Vol}(S) \rightarrow \text{Vol}(S, t)$, where t denotes cosmological time, and the directional density becomes:

$$\rho(t) = \frac{|D_k|}{\text{Vol}(S, t)}$$

As the volume increases, the density decreases, which creates an internal space available for new directions. If the domain was initially saturated, the expansion causes a desaturation, $\rho(t) < \rho_{\max}$, due not to a loss of directions but to the increase in volume. It reactivates the exponential division: $D_{\{k+1\}}(t) = \cup \Delta(d)$, the union being $D_k(t)$. The hierarchy extends to a higher level, and the process repeats as long as the expansion continues to create available internal space.

When the volume tends to infinity, $\text{Vol}(S, t) \rightarrow +\infty$, the saturation condition $\rho(t) = |D_k(t)| / \text{Vol}(S, t) = \rho_{\max}$ can only be maintained by increasing the cardinality of the directional set indefinitely: $|D_k(t)| \rightarrow +\infty$, so $k(t) \rightarrow +\infty$. Exponential dimensions tend to a potentially infinite number.

Expansion thus appears as an increase in internal directional capacity. Each increase in volume creates a deficit in directional density, allows for the addition of new directions, expands the hierarchy, and pushes saturation to a higher level. The universe does not have a fixed number of internal dimensions: it continually generates new directional levels to compensate for expansion. In a static universe, these levels would be limited by saturation; in an expanding universe, saturation is constantly disturbed, resulting in continuous directional growth. Saturated structures, such as black holes, must continually adjust, and the universe has internal dynamics of dimensions, distinct from classical spatial dimensionality.

8. Dynamic dimensions

8.1. Nature of a directional dimension

Classical models describe dimensions as fixed x, y, z axes, straight, immutable, rigid, incapable of reacting to matter or light. Space is a setting, a passive framework. Directional geometry reverses this perspective: a dimension is neither an axis, nor a line, nor a landmark. In an S domain, it is the set of internal directions that can be accessed:

$$\text{Dimension}(S) = D(S)$$

A dimension is a directional capacity, that is, all the internal orientations that a domain can support. A domain that has few directions has few dimensions; a domain that has an exponential hierarchy of directions has exponential dimensions. Dimension is not an abstract mathematical object, but a physical property of internal space.

These directions are alive: they bend, contract, saturate, desaturate, reorganize, and react to matter, energy, movement, and light. Space ceases to be a container and becomes a dynamic system, capable of evolving, deforming, densifying, and rebalancing. Dimensions do not describe space: they construct it.

8.2. The engine of dynamics: directional density

The directional density $\rho = |D| / \text{Vol}(S)$ determines the internal state of a domain, and when it changes, the internal directions change. If ρ increases, the directions move closer together, the effective granularity decreases, and the dimension contracts ($\rho \uparrow \Rightarrow$ contracted dimension). If ρ decreases, the directions move away, the effective granularity increases, and the dimension

stretches ($\rho \downarrow \Rightarrow$ stretched dimension). Density is therefore the driving force of dynamics: it governs the shape, curvature, and stability of dimensions. Matter contracts dimensions, cosmic expansion stretches them.

Motion itself transforms directional space. A particle does not move in a predefined space, but in the available internal directions: by moving, it changes the directions it uses, modifies the directions it influences, and locally reorganizes the directional space. Motion leads to a reorganization of internal directions. Similarly, the presence of mass changes the directional density: the higher the mass, the more the internal directions contract, which manifests itself in a local increase in density, a decrease in effective granularity, and a curvature of internal directions. Mass produces a directional curvature. Matter does not bend space as in classical relativity: it bends internal directions, and therefore dimensions.

8.3. Curvature, Contraction, Saturation, Desaturation

Since a dimension is a set of directions, it can be deformed, and dimensional curvature is not an optical illusion but a physical deformation of directional space. Light demonstrates this: a photon follows an internal direction; if the direction curves, the photon curves, so the dimension actually curves.

Under the effect of mass, the dimension contracts: it becomes tighter, denser, more difficult to cross, the light slows down, the trajectories curve and the space narrows. When the density reaches $\rho_{\max} = 1/\delta$, the dimension becomes incompressible: no new direction can be added, the internal structure is full and the dimension reaches its maximum state. Black holes are the perfect example of this, since they saturate all their internal dimensions; light can no longer propagate through them, and the dimension is closed, saturated, complete. Saturation is a measurable physical state, which reveals the ultimate limit of directional geometry.

Conversely, when the volume increases, $\text{Vol}(S) \uparrow \Rightarrow \rho \downarrow$, an internal margin appears and the dimension reopens. The exponential division then generates new directions according to $D_{\{k+1\}} = \cup \Delta(d)$: the dimension desaturates, reorganizes, multiplies and regains its capacity for internal growth. In an expanding universe, this phenomenon is constant, and expansion is not a simple dilation of space but a directional desaturation on a universal scale. It is a reactivation, a permanent rebirth of dimensions: the universe does not extend into a pre-existing space, it creates new internal directions by expanding.

A directional dimension is thus a dynamic, sensitive and reactive phenomenon, which evolves with the internal state of the domain. It can bend, contract, stretch, saturate, desaturate, reorganize and multiply, in reaction to light, matter, density, movement and cosmic expansion. All these properties form the basis of what can be called the living geometry of space.

8.4. Physical Implications

Black holes represent the opposite extreme of expansion. In one, $\rho = \rho_{\max}$ and all internal directions are occupied; in the other, the density decreases and the dimensions multiply. When a black hole absorbs matter, its volume increases, its directional density decreases, it temporarily

desaturates, generates new directions, and its radius increases to restore saturation. Its growth is a directional mechanism, not a classical gravitational phenomenon. Black holes become cosmological instruments that reveal the minimal granularity of the universe.

At the microscopic scale, particles move in a dynamic directional space: they modify the directions they use, locally rearrange the directional density, and curve the dimensions they cross. Quantum phenomena, uncertainty, superposition, and non-locality, can be interpreted as manifestations of this dynamic: minimal granularity imposes limits of precision, local saturation prevents certain trajectories, desaturation allows for sudden transitions, and light reveals the available internal directions. Quantum physics becomes a consequence of dimensional dynamics.

Directional geometry thus offers a unified vision. Dimensions are sets of internal directions, directions are dynamic, directional density determines the shape of space, light reveals the internal structure, matter distorts directions, expansion desaturates dimensions, and black holes saturate them. Gravity becomes a directional contraction, expansion becomes directional desaturation, quantum physics becomes internal dynamics. It is not an extension of physics but a complete reformulation of the structure of the universe, capable of describing space at all scales, from the photon to the black hole, from the particle to the entire universe.

9. Light, revealing dimensions

9.1. The photon as a directional probe

Light occupies a central place in directional geometry. It is not only an electromagnetic phenomenon: it is the natural revealer of internal dimensions. A photon does not calculate the x, y, z axes, does not consult any Cartesian landmarks, no spatial grids, no imposed metrics. It simply moves in all the available directions within a geometric domain.

Two properties of the photon are essential: it can move in any available direction, and it vibrates only in one internal direction. It follows that each direction accessible to a photon is a real dimension, that each photon vibration corresponds to an internal dimension, and that:

the directions accessible to the light = the internal dimensions of the domain

If a photon can move in one direction, that direction exists as a dimension. Light does not create dimensions: it reveals them. This is why the formula summarizing the method can be stated as follows: directions are dimensions, photons reveal directions, exponential division calculates dimensions, and dimensions are relative to the observer.

9.2. Light in exponential space

If a domain has a directional hierarchy $|D_k| = |D_0|k$, light can move in each of these directions and thus reveals an exponential number of internal dimensions. Exponential dimensions are visible only because light can propagate through them. Without it, the directional structure would remain invisible: light is the bridge between internal geometry and physical observation.

A photon travels in an internal direction d belonging to $D(S)$ and follows the directional structure of the domain. If a direction exists, light can take it; if it disappears, light can no longer pass through; if it deforms, light deforms; if it multiplies, light reveals new trajectories. Light is thus the revelation of $D(S)$: it shows which dimensions are actually present in a domain.

9.3. Curvature, Contraction, Saturation and Desaturation Revealed

Light is an instrument for measuring living geometry. Near a mass, in a gravitational field, in a black hole or in a contracted domain, it bends because the directions bend: the curvature of $D(S)$ causes the curvature of light, which makes it possible to measure the real curvature of the dimensions without an imposed model or mathematical approximation.

As the directional density increases, $\rho \uparrow$, the internal directions contract, and the light reacts immediately: its path narrows, its effective velocity decreases, its path becomes denser. The contraction of the dimension results in a contraction of the light path, so that the light measures the directional density.

In a saturated domain, $\rho = \rho_{\text{max}} = 1/\delta$, all internal directions are occupied, no additional vibration is possible, and light propagation becomes impossible: light is absorbed, stopped, or deflected outwards. Directional saturation causes the light to go out, which then shows that the domain has reached its directional limit, as in a black hole.

When the volume increases, the density decreases and the light finds wider, more flexible, more extensive trajectories. In an expanding universe, it stretches, its trajectories dilate and the dimensions desaturate: the light exposes the cosmic dynamics of the dimensions.

9.4. A geometric instrument

Light is therefore not a mere messenger, but a geometric instrument. It reveals which directions actually exist, which directions are saturated, which directions are forbidden, how many internal dimensions a domain can support, as well as the curvature, contraction, saturation, desaturation, and internal dynamics of a domain. If the directions are exponential, so are the dimensions. Light does not describe space: it reveals it.

Conclusion

Exponential division is not only a geometric operation: it is a conceptual method for calculating the real dimensions of space, starting from a point and subdividing a sphere according to exponential logic. From six primary directions, it produces $6k$ directions after k steps, a hierarchy whose cardinality grows exponentially, independently of the volume of the domain, until the minimum directional granularity imposes saturation. Pushed up to the Planck length, the subdivision of the sphere gives the maximum number of accessible directions, $D_{\text{pot}}(R) = 4\pi R^2 / l_P^2$, of which the effective dimensions use only a part.

The dimensions, which are the directions, are no longer fixed axes but living structures. They are relative to the observer, reoriented by the rotation of the interlocking frames of reference and shaped by the cosmological vortexes. They contract under matter, become saturated in black

holes, desaturate and multiply in an expanding universe, where their number tends towards infinity. Light, which propagates in all accessible directions and vibrates in only one, is the revealer: it exposes the curvature, density, saturation and directional limit of each domain. Dimensions do not describe the universe: they build it. This principle paves the way for the following chapters, where the directional structure of space will be put to work to understand matter, light and the dynamics of the Universe.

Chapter 4 — Space-Time, Gravity, and Distances

In directional physics, space-time is neither a passive canvas nor a stationary frame in which objects would evolve. It is not a neutral setting, independent of matter. This chapter brings together the consequences of this statement: if the medium itself is dynamic, then gravity, mass, time, light, and the measurement of distances must be rethought in the same motion. We will start with the space-time fluid and its vortexes, derive dynamic gravity from it, and then examine the slowing down of time, the synchronization of clocks, and the non-expansion of atoms and photons. Finally, we will see how the dual nature of the speed of light distorts the estimation of distances and distorts the observed universe, before asking ourselves about the smallest distance that space can sustain.

Space-time as a dynamic fluid

A living fluid

Space-time is a dynamic fluid: a fluid that deforms, contracts, densifies, expands, and reacts to energy, mass, rotation, and directional tension. It is a living fluid, capable of trapping, guiding, and structuring the internal strings of confinement. In this vision, confinements are not objects separated from the medium: they are the medium, on a local, compact, and directional scale. Each confinement is a densified portion of space-time, each string is a line of tension in this fluid, each movement reorients it, each rotation contracts it, and each input of energy stretches it.

The internal structure of a confinement then determines its role in the fluid. A string-rich confinement acts as an extremely dense region of spacetime: it traps the strings, orients them, tightens them, and amplifies the directional tension, becoming a geometric knot in the cosmic fluid. A confinement without strings, on the other hand, is a region of weak spacetime: it stretches, deforms, expands under gravity, retains no internal tension, and slides into the fluid without ever structuring it.

A feedback loop connects these elements. The more strings a confinement contains, the more it densifies the fluid; the denser the fluid, the more it traps the strings; the more the strings are trapped, the more the directional tension increases; the more the tension increases, the higher the dynamic mass; and the higher the dynamic mass, the more intense the distortion of the fluid becomes. Hence the central idea of this cosmology: space-time is a dynamic fluid, and confinements are its geometric vortexes.

The fluid drives everything

Matter does not move through spacetime: it is transported by its flow. When the fluid flows, the confinement flows with it; when the fluid rotates, the confinement rotates; when the fluid contracts, the confinement contracts; and when the fluid expands, the confinement expands, unless it contains sufficient string density to resist. A string-rich confinement anchors itself in the fluid, resists deformation, shapes the flow, and becomes a geometric motor within it. A cordless confinement is fully driven, unable to resist or structure the flow, stretched, diluted, and distorted by the dynamics of spacetime.

A fundamental principle follows from this: the space-time fluid drives motion, and confinements only modulate the way they are transported. Speed is not an independent property, it results from the way the fluid flows around and through a confinement. Gravity is not a force: it corresponds to the flow of the fluid towards the regions of greater density. Distortion is not a curvature: it is the compression of the fluid under directional tension. Dynamic mass is not an intrinsic quantity: it measures the resistance of a confinement to the fluid and its ability to redirect it. The VSMD motor therefore does not push the ship; it restructures the fluid and creates a directional flow that carries the ship faster than light in effective distance, without ever exceeding the local limit imposed by c . This is the first law of dynamical fluid cosmology: the fluid drives everything, the confinements shape the flow, the flow shapes the movement.

The Rotating Universe and Vortices

The universe is not static: it is rotating, and this rotation, physical, geometric, and directional, drives space-time itself. When the universe rotates, the fluid rotates, and everything in it is swept away: galaxies, clusters, cosmic filaments, star systems, and local confinements. A galaxy does not rotate in space-time, it rotates with it, like a vortex in a rotating ocean. Its spiral shape is the signature of a moving fluid: the spiral arms correspond to streamlines, the central bulge to a density node, the halo to an area of stretched fluid.

In any fluid, the presence of mass creates a vortex, and directional cosmology applies this law to all scales. A star forms a local vortex, a black hole an extreme vortex, a galaxy a massive vortex, a supercluster a cosmic vortex, and the entire universe a fundamental vortex. Gravity thus corresponds to the rotation of the fluid around masses: the greater the mass, the deeper the vortex; the deeper it is, the more intense the distortion; the more intense the distortion, the smaller the actual distance.

Cosmic rotation becomes the primary source of space-time's dynamics, tension, distortion, and internal geometry. Filaments are stretched, superclusters aligned, space-time currents become directional, and dimensions emerge from the overall motion. If spacetime is rotating, it drives matter; if matter is dragged, it structures the fluid; if fluid is structured, it creates dimensions. These vortices are not anomalies: they are the natural drivers of cosmic dynamics.

Dynamic mass and dynamic gravity

A living equation

The equation $E = M \cdot c^2$ is often presented as a fixed identity describing a static state of matter. However, mass is never stationary: it reacts, deforms and increases under the effect of motion, rotation, directional tension and internal confinement. An object in motion does not have the same mass as an object at rest, and this variation directly modifies the total energy. Einstein's equation then becomes a living equation, sensitive to directional conditions, which describes not only what mass is but what it becomes when it is set in motion.

In directional physics, mass is further amplified by the internal structure of confinement. A stringless confinement stretches under gravity, unable to resist the distortion of space-time; a string-rich confinement becomes compact, dense, and reinforces the directional tension that amplifies the dynamic mass. Dynamic energy is written:

$$E_{\text{dyn}} = \gamma M_0 c^2 T_{\text{conf}}$$

where M_0 is the mass at rest, γ the relativistic factor, T_{conf} the directional tension of the confinement and E_{dyn} the total dynamic energy. Mass, energy, speed, rotation and internal geometry appear to be intimately linked.

Dynamic mass

At rest, the mass reflects only the internal cohesion of the confinement: the density of its strings, the minimum directional tension that maintains its shape, and the geometry that structures its internal space. As soon as the object starts to move, its mass increases. Displacement imposes directional pressure on the internal strings, tightens the geometry, and amplifies the centrifugal tension. As speed increases, so does the dynamic mass, as the strings have to travel through an increasingly denser space-time, which requires more energy.

Rotation intensifies this dynamic. In a stringless confinement, gravity stretches the structure, disperses the tension, and weakens the cohesion; in a string-rich confinement, the rotation compacts the structure, increases the directional density, and densifies the space-time. The dynamic mass is therefore the result of the velocity, rotation, centrifugal tension, and directional density of the confinement:

$$M_{\text{dyn}} = \gamma M_0 T_{\text{conf}}$$

It is an amplified, directional, geometric mass that transforms motion into tension, tension into distortion, and distortion into propulsion. It explains why an SMD ring can achieve a directional mass capable of distorting space-time and reducing actual distance.

Increasing energy increases mass

Energy is not a quantity separate from mass: it is the internal tension of confinement, the directional pressure that passes through its strings, and the geometric force that structures spacetime around it. When energy increases, mass also increases, not because matter is created or destroyed, but because directional tension increases, compacting confinement and densifying spacetime. In confinement without strings, energy cannot accumulate: the structure stretches and disperses tension. In a string-rich confinement, energy is converted directly into internal tension: strings tighten, geometry compacts, directional density increases, and dynamic mass rises.

The dynamic mass is thus directly related to the total energy:

$$E_{\text{dyn}} = M_{\text{dyn}} c^2$$

Increasing energy increases dynamic mass, which increases distortion, compacts space-time and reduces actual distance. The more strings a system contains, the more energy it can accumulate, and the more it densifies space-time. Energy is therefore not a simple parameter: it is the key that controls mass, gravity, distortion and propulsion.

Dynamic gravity

Gravity is neither a force, nor a mysterious field, nor an attraction between two masses. It is a dynamic distortion of space-time, produced by mass, amplified by energy, structured by the internal geometry of confinement and modulated by the directional tension that flows through its strings. At rest, an object generates minimal distortion, the natural curvature of its internal confinement; the more strings it contains, the more densely it densifies the meter around it. But as soon as it starts to move, speed increases dynamic mass, rotation amplifies centrifugal tension, strings tighten and distortion becomes more intense, more oriented, deeper.

Gravity then ceases to be a passive curvature: it becomes a directional tension capable of reducing the real distance around the object. This reduction in distance is the central phenomenon of dynamic gravity. It is written:

$$G_{\text{dyn}} = k(\gamma M_0 c^2) T_{\text{conf}}$$

where G_{dyn} is the dynamic gravity, k is the geometric coefficient of distortion, $\gamma \cdot M_0 \cdot c^2$ is the total dynamic energy and T_{conf} the directional tension of the confinement. The more strings a confinement contains, the more compact it is, the more the dynamic gravity increases, the more the actual distance decreases, and the more the effective velocity increases.

The distortion of space-time

Distortion is the central phenomenon of directional physics. In classical physics, spacetime curves under the effect of mass, but it does not compact: the actual distance remains unchanged. In directional physics, distortion is active: it contracts spacetime in front of an object and expands it

behind it. This directional asymmetry is the key to the VSMD engine. It depends directly on the dynamic mass:

$$D_{\text{dist}} = k M_{\text{dyn}} c^2$$

where D_{dist} is the compression of spacetime, k is the geometric coefficient of densification, M_{dyn} is the dynamic mass, and c is the local limiting velocity. Stringless confinement cannot generate any significant compression; string-rich confinement enhances local compression.

When compression reaches a critical threshold, the actual distance becomes less than the observed distance: the spacecraft passes through compacted space, where each actual meter corresponds to several standard meters. The VSMD engine does not exceed the light in velocity, it exceeds it in distance. The effective velocity becomes superluminal not because the spacecraft violates the limit of c , but because it travels less space in a universal second. Energy creates mass, mass compacts space, compacted space reduces true distance, and reduced distance allows for superluminal effective velocity.

Potential dimensions

The cube analogy sheds light on the role of motion in the structure of space. A cube in a room appears to have three fixed edges, X, Y, and Z, independent of the rest of the universe. This is an illusion: the Earth rotates on its axis and around the Sun, the solar system rotates in the galaxy, the galaxy moves through the cosmos, and the universe itself may be rotating. The three directions of the cube change direction at every moment, driven by higher motions; they are three directions in constant motion.

A direction that evolves under the effect of a higher movement is a potential dimension: a direction capable of becoming a real dimension when the directional tension or the dynamic mass of the system activates it. Each direction is a potential dimension; dimensions are not given by space, they are created by movement. In a string-rich confinement, internal directions become active, densify space-time, modify the local metric, and reveal additional dimensions. In a cordless confinement, no internal direction is activated and the system remains limited to the three classical dimensions.

Matter, distortion and slowing down of time

Matter is never neutral

Each mass, tiny or colossal, imposes a tension on the geometry of space-time. This tension creates a curvature, a local deformation that modifies the organization of internal directions and the flow of time. The larger a mass, the deeper the distortion: space contracts around it, directional volumes tighten, and time slows down. Matter acts as an anchor point that attracts directions, bends and condenses them.

Motion acts as a directional multiplier. When an object moves, its energy increases and results in an increase in its dynamic mass, which intensifies the internal tension of the directions,

strengthens the geometric density, and increases the curvature. The higher the speed, the more the geometry contracts around the object, the tighter the internal directions, and the slower time becomes. Velocity is therefore not just a displacement: it is a geometric force that changes the cadence of time and the structure of space. The fundamental principle is this: matter bends space-time, and its motion intensifies this curvature.

When space contracts, time slows down

Space-time is a living geometry that contracts, expands, and deforms under the effect of matter and motion. When space contracts, its internal structure tightens, directions move closer together, and the available volumes decrease; this contraction immediately changes the cadence of time. The directional density increases, the internal cycles stretch, and each second becomes longer to traverse. Tightened geometry acts as a natural brake on lived time. The law is simple: when space contracts, time slows down, and it accelerates when geometry opens up.

This contraction is not caused solely by mass. A fast-moving object sees its dynamic mass increase, which tightens the geometry around it. The contraction of space and the slowing of time are two aspects of the same directional phenomenon, present in every dimension, structure, and dynamics of the universe.

Universal time and lived time

Time is universal. It has its own cadence, a fundamental progression that does not depend on objects, dimensions, or observers. Yet its apparent speed changes according to the amount of mass present in a region of space-time. This slowing down is not an illusion: it results from directional density, which constricts internal directions, increases geometric tension and stretches temporal cycles. Universal time remains the same, but lived time, that measured by a system, becomes slower.

This distinction is the foundation of what follows. A dilation of time does not create a new time or a second clock: each unit of time retains its definition, but takes longer to manifest. Time does not change, it slows down, like a fluid flowing through a channel: the fluid remains the same, but its speed decreases. Events take longer to occur, the temporal structure remains intact, and only the progression stretches.

Time dilation and synchronization

Fixed and dilated pulses

A clock or a timekeeping system relies on internal pulses. If these pulses maintain their normal rhythm as time expands, the clock moves faster than the actual flow of time: this is the root cause of desynchronization. Two clocks placed in different time environments do not desynchronize because time changes, but because their pulses do not follow the dilation.

Synchronization is therefore not an absolute phenomenon: it is a relationship between two rhythms. Two systems are synchronized when their pulses occur with the same spacing, their cycles progress at the same cadence, and their measurements remain compatible. For a system

to remain synchronized in dilated time, its pulses must adapt to it, through proportional spacing, dynamic modification of the internal rhythm, and coherence aligned with the dilated flow. A clock must not beat at a fixed rate, but at the rhythm of slowed time.

This rule applies to internal synchronization, where the system adjusts its pulses to the local time flow, as well as to external synchronization, where it aligns itself with an external reference: synchronization depends on the adaptation of the rhythm, not on the nature of the time. When the pulses follow the dilation, the measurements remain consistent, the chronologies remain aligned, and the events can be compared without phase shift. The dilation of time is no longer a disturbance: it becomes a change of scale.

The biological clock

The biological clock works through internal, hormonal, metabolic, circadian and cellular cycles. These cycles are not fixed impulses: they are continuous processes that move forward according to the speed of time flowing. The biological clock does not beat, it progresses. If time passes more slowly, chemical reactions slow down, hormonal cycles stretch, cellular processes take longer and internal rhythms dilate. The body does not become out of sync, because its processes depend directly on the flow of time; it is intrinsically synchronized with real time, regardless of its rhythm.

Biological desynchronization occurs when the environment imposes an artificial rhythm that is different from the internal one: artificial light cycles, hormonal disturbances, stress, sleep deprivation, non-aligned external signals. The clock then tries to follow two rhythms, one related to real time, the other to the environment, and it is their discordance that disturbs it, not the dilation of time. In dilated time, the organism naturally slows down and its cycles retain their coherence, without correction or external impulse.

Human perception is based on this clock. It is not an objective measure but an interpretation produced by the brain, according to the speed of neural processes, the rhythm of biological cycles, attention, memory and physiological state. In dilated time, neural signals take longer duration, sensory perception expands and memory encodes more slowly: intervals seem longer, actions more spaced out, transitions slower. This fragmentation is not an error, but the consequence of a brain that progresses at the dilated rhythm of time. A discrepancy only appears in the event of a discrepancy between internal and external rhythms, due to disturbed attention, fatigue, stress or incompatible signals. The dilation of lived time is neither psychological nor illusory: it is a directional property of lived time. An individual in dilated time experiences more conscious duration in the same universal second, and his brain encodes more internal events. That's why an hour of waiting seems longer than four hours of work.

Cyanobacteria, the world clock

Cyanobacteria offer the purest example of a biological clock. Very simple single-celled organisms, they have an internal biochemical oscillator made up of the proteins KaiA, KaiB and KaiC, which is remarkably precise in tracking day-night cycles, and works even in the total absence of light. Their

clock is a cycle, not an impulse: they produce no fixed pulses, do not use any imposed frequencies and rely solely on continuous biochemical cycles.

Their rhythm depends directly on the speed of time flow. If time expands, enzymatic reactions slow down, phosphorylation and dephosphorylation cycles stretch, the progression of the KaiC cycle takes longer, and the internal clock expands naturally. They never drift, because they have no imposed frequency, no fixed pulse, and no rhythm independent of real time: they follow time because they are built on time. They show that synchronization is not a property of biological complexity but of the cyclic nature of the system: cyclic systems are naturally synchronized with time dilation, fixed-pulse systems are not. They have a stable circadian cycle, a self-regulating oscillation and a perfect adaptation to time metrics; they are the ideal clock to measure dilated time.

The atomic clock and its limits

An atomic clock measures time by counting the oscillations of an atom, usually cesium, whose electronic transitions produce pulses of great regularity. This rigidity is not only its precision, but also its weakness: it imposes its own rhythm and does not adapt to the temporal environment. When time expands, its pulses continue at the same rate and it moves faster than real time; it measures time that no longer exists in the real environment.

It cannot adapt for three reasons: atomic frequency is intrinsic and depends on the structure of the atom, not on the flow of time; electronic transitions are fixed and do not slow down spontaneously; the measurement system is rigid and counts pulses without ever adjusting them. The shift accumulates gradually, pulse after pulse, and the greater the expansion, the greater the desynchronization. The more rigid a clock is, the less it can keep up with the dilation of time. The atomic clock remains accurate in undilated time, but becomes incorrect as soon as the flow changes: in a satellite, it drifts and must be corrected. It is perfect for measuring a photon, an atom, an invariant phenomenon, but useless for measuring time dilation.

Directional saturation

Matter can distort space-time, contract geometry, and slow down time, but this capacity is not infinite. Every structure has a directional limit, directional saturation, where density, pressure, and internal tension become so extreme that matter ceases to function normally. It appears when contraction reaches a level where internal directions can no longer fold: geometry becomes rigid, volumes shrink to almost nothing, and time stretches to the point of stillness.

Atoms are the first to reveal this limit. As long as the directional pressure remains low or moderate, the atom retains its fixed internal rhythm. But in regions of extreme contraction, such as the horizon of a black hole, the inner layers of the atom deform, the orbitals compress, the quantum transitions become saturated, and the atomic rhythm collapses. The atomic clock then loses all coherence: it does not follow geometry, it suffers from it. Saturation marks the boundary between stable matter and deformed matter, the point where geometry triumphs over structure

and time, matter, and space become one and the same tension. Matter distorts spacetime, but spacetime can also distort matter to its limit.

Atoms and photons: non-expansion

Invariant objects

At the heart of a changing metric, two structures remain invariant: atoms and photons. They do not stretch when space stretches, do not slow down when time slows down, and do not follow the expansion of metrics. They retain their size, internal frequency, directional rhythm, and structure. They follow universal time, not proper time. Metric expands, but fundamental objects do not expand.

It is this discrepancy between a metric that expands and objects that remain invariant that produces the observed phenomena: the variation in the observed speed of light, the contraction of perceived distances, the dilation of proper time, the drift of atomic clocks, and the illusions of traveling into the future. Time does not fragment, does not create alternative futures, and does not allow us to jump into an era that already exists. What changes is the rate at which an observer experiences the same universal time, slower, faster, more densely, or more stretched, depending on the directional metric of his environment.

Space and time, a single metric

Space and time are not two separate entities: they form a single metric, a single fabric, a single directional flow. If time stretches, space also stretches, and the dilation of time causes space to dilate. When an observer's own time expands, his seconds lengthen, his internal processes slow down, and his directional perception changes. A real distance remains the same, but the perceived distance changes and the observed time to travel it increases. The observer does not cross a larger space: he crosses a space dilated by his own temporal rhythm.

The speed of light in dilated time

Local constant, observed velocity

The speed of light is universal in its nature but relative in its perception. Locally, it is always c : the internal frequency of the photon never slows down, its propagation does not change, and it does not "feel" the dilation of time. But when the flow of time expands, the units of duration stretch for the observer, who measures the photon's propagation through a modified time metric. The time measured is longer, the apparent distance shorter, and the observed speed decreases. Light does not slow down: it is the observer who measures differently.

There are two levels: the local velocity, which always remains c , and the observed velocity, which depends on the rhythm of the flow of proper time. Light remains perfectly synchronized with universal time: it has no internal impulse, does not depend on any mechanical rhythm and therefore cannot be desynchronized. The observer, on the other hand, depends on his own flow. The speed of light is a physical constant, but a perceptual variable: constant locally, variable globally according to the point of observation.

Photonic distance

In local physical reality, the photon always travels the same distance in the same universal time; the real distance does not contract. For the observer whose time is expanding, the distance attributed to the photon becomes, according to the author's relation, observed distance = $c \times$ dilated time, and the progression of the photon seems to be slower: the apparent distance contracts as time expands. This contraction is not a physical phenomenon but a metric phenomenon: it is the observer's measurement grid that is distorted, not the photon. The distance depends on the proper time, not on the photon. The photon always travels the same distance, but the observer does not measure the same length.

A photonic-biological clock

Classical measurements are based on fixed pulses, atomic oscillations, electronic cycles, quantum transitions, which are precise but unable to follow the dilation of time. The author proposes to synchronize directional lasers with the KaiC cycle of cyanobacteria. Lasers have a local frequency that never slows down and a perfectly stable propagation, but they cannot detect time dilation on their own. Cyanobacteria provide the adaptive reference: they dilate their internal rhythm exactly as time expands.

The clock consists of three elements: the KaiC cycle, an adaptive time reference; the directional laser, a pulse system with an invariant frequency and no internal drift; and the synchronization module, which detects the phases of the cycle, triggers the laser pulses and adjusts the rate. Its operation is simple: at each key phase of the KaiC cycle, the module triggers a pulse; when time expands, the cycle stretches, the module waits longer and the laser emits at an expanded rate. The lasers do not slow down, they wait longer between pulses: it is not their internal frequency that changes, but their emission rate, controlled by the biological reference.

The complete architecture is organized into four layers: the biological cycle, which progresses continuously without a fixed pulse; the bio-directional sensing, which measures the phases and converts them into directional signals; the synchronization module, which calculates the photon cadence; and the directional laser, which emits stable pulses with invariant propagation. The laser provides precision, cyanobacteria adaptation, modulus coherence. There is no drift in dilated time, and synchronization remains consistent in normal time, in dilated time, and in a variable directional environment. This clock eliminates the need to resynchronize satellites and makes it possible to measure the true time metric of the universe. It is based on one principle: a clock should not impose its rhythm, it should follow time. Light is constant, but the measurement of time should not be.

The dual nature of C and the estimation of distances

C₀ and C_v

The observed universe is not necessarily the real universe: it is filtered by the observer's local metric, by its internal dynamics, and by the apparent speed of light it measures. The speed of light has a dual nature, a cornerstone of directional physics. For the photon, C₀ is a universal internal

constant, independent of metrics, time dilation or spatial stretching. It represents the internal directional voltage, local dynamics, natural frequency and structural invariance of the photon; it is the only truly stable velocity in the universe. For the observer, immersed in a fluid and variable geometry, the measured velocity is no longer C_0 but an apparent velocity:

$$C_v = C_v(\text{métrique})$$

which depends on time dilation, spatial stretching, local curvature, centrifugal tension of the system, and the fluid geometry of spacetime. In a stable environment, where gravity is weak or moderate and spacetime shows no significant deformation, $C_v = C_0$: light passes through space without metric resistance and C can be treated as a constant in classical equations. In an extreme environment, an expanded metric gives $C_v < C_0$ and a contracted metric gives $C_v > C_0$.

The mass of the photon

The photon can never be observed at rest: its mass at rest can therefore neither be measured nor defined. The author concludes that the photon has a minute mass, but only in motion, i.e. permanently. This directional mass is neither static nor inertial in the classical sense; it is defined by the internal tension of the particle, the local frequency, the directional dynamics, the internal rotation and the minimal geometric structure of the photon nucleus, and is written as a function of the internal dynamics:

$$m_\gamma = m_\gamma(\nu, C_v)$$

where ν is the frequency and C_v is the apparent velocity in the observer's metric. Several phenomena require it: gravitational deviation, which involves directional inertia; the capture of a photon by a black hole, which requires minimal inertia; trajectory curvature in a distorted metric, which implies an inertial response; and the energy transport $E = h\nu$, to which corresponds the mass equivalence $m = E/c^2$. This mass is tiny, not directly measurable, always present, strictly related to motion, and dependent on metrics, frequency, and directional voltage. It cannot be isolated because the photon cannot be stopped, and any attempt to measure it alters its dynamics.

The apparent slowing down of the photon

In a strongly curved space-time, the internal directional voltage of the photon encounters geometric resistance. In the vicinity of a black hole, a neutron star or a massive cluster, the photon undergoes a deflection, loses part of its directional energy, sees its frequency decrease and shows an apparent slowdown. The internal velocity C_0 remains constant; it is the apparent velocity that varies:

$$C_v = C_v(\text{gravité, dilatation, géométrie})$$

In such a region, the observer's own time expands, the local space stretches, the trajectory curves, the frequency decreases, and the directional dynamics compress. As $E = h\nu$, the decrease in

frequency decreases the energy transported, which results in increased directional inertia and reinforces the apparent slowdown. The photon does not slow down in its internal frame: it slows down in the observer's frame, whose metric is distorted. C is thus constant in a stable environment and variable in an extreme environment.

E = mc² with variable speed

When C varies for the observer, all the equations that use it become dynamic. The equation of energy, which classical physics holds to be a fixed relation based on a static mass and a strictly constant speed of light, is transformed:

$$E = m(c_v) c_v^2$$

and, for the photon:

$$E = m_\gamma(C_v) C_v^2$$

The directional mass depends on the apparent velocity, which depends on the local metric, hence the chain of dependence $C_v \Rightarrow m_\gamma \Rightarrow E$: the variation of C leads to that of the mass, which leads to the variation of energy. An expanded metric reduces c_v , a contracted metric increases it, and increased directional dynamics increases c_v . The energy of the photons is then not constant, and light spectra, redshift measurements, distance estimates, and expansion models become sensitive to the local metric. The equation $E = mc^2$ ceases to be universal: it becomes local, dependent on the gravitational environment.

False estimation of distances

In classical cosmology, the distance of a distant object is estimated from the travel time of light, according to $D = C \times t$, which assumes that C is strictly constant throughout the universe. In the directional framework, the observer calculates:

$$D_{\text{observée}} = C_v \times t_{\text{observé}}$$

while the actual distance is:

$$D_{\text{réelle}} = C_0 \times t_{\text{universel}}$$

These two distances are equal only if the metric is perfectly stable. In dilated space, local time stretches, light seems to slow down ($C_v < C_0$), and $D_{\text{observée}} < D_{\text{réelle}}$: distant objects appear closer than they are. In contracted space, time tightens, light seems to accelerate ($C_v > C_0$), and $D_{\text{observée}} > D_{\text{réelle}}$: distant objects appear farther away. The observed distance depends on the observer's metric, the actual distance on universal dynamics; each cosmological distance becomes an interpretation, not an absolute value.

False Estimation of Distances refers to this fundamental error. It affects the measurement of distant galaxies and quasars, light trajectories in massive clusters, gravitational lensing, cosmic expansion calculations, cosmic background observations, and large-scale structure models. A directional correction becomes essential to reassess the true size of the observable universe, the rate of expansion, the mass distribution, and the overall geometry of spacetime.

Towards a distorted universe

Light, a vector of deformation

The universe that humanity observes is filtered, altered, compressed or stretched by the metric that light passes through before reaching the observer. Light is not a neutral messenger: each photon carries information altered by the metric traversed, local gravity, time dilation, spatial stretching and directional variation of C_v . The observed image is the directional projection of an object whose shape, size and position have been modified by the photon's travel. The observer never receives the object itself, but this projection: a distorted position, an altered distance, a modified frequency, a transformed energy, a curved trajectory.

In a dilated metric, the local time stretches, C_v and frequency decrease, the trajectory curves more: the objects appear closer, more stretched, slower. In a contracted metric, the local time tightens, C_v and frequency increase, the trajectory straightens: the objects seem more distant, more compressed, faster. The observer does not see real time, he sees projected time.

Shapes, spectra and colours

Light never follows a straight line in distorted space-time: it follows local geometry, which produces stretching, twisting, curvatures, tilts and distortions of scale. The galaxies observed become arcuate, stretched, fragmented, asymmetrical, sometimes duplicated. What the observer interprets as a cosmic shape is a projection of the geometry traversed.

The variation of C_v also leads to the variation of the directional mass m_γ , the energy transported E and the frequency ν , which modifies the apparent color, the light intensity and the observed spectrum. Spectral distortions are not only due to redshift: the phenomena attributed to the expansion are also directional projections of the variation of C . Each image is an altered version of the real object, each distance a distorted estimate, each spectrum a transformed signature.

Space-time as a lens

In classical physics, a lens is a material object that deflects light. In directional physics, the lens is geometry itself. The metric is not a neutral background but a dynamic surface, which deforms under the effect of gravity, mass density, local energy, directional voltages, and geometric gradients; when it varies, it stretches, compresses, twists, tilts, and fragments. The gravitational lensing of classical cosmology is only a special case: any region of distorted metric acts like a lens, even without extreme mass, black holes, or galactic clusters.

The variation of C is the internal driver of this optical deformation. A dilated metric slows down the photon, stretches the images, curves the trajectories, and decreases the frequency; a

contracted metric accelerates it, compresses the images, straightens the trajectories, and increases the frequency. Unlike a material lens, spacetime changes shape, intensity, tension, density, and geometry: it is a living lens that distorts the universe in real time. Each photon passes through a different lens, and each observer sees a different version of the universe. The distances, velocities, shapes, spectra, and dynamics that classical cosmology takes to be real phenomena are, for directional physics, metric illusions. The visible universe is not the real universe: it is the universe distorted by the space-time lens, and cosmic reality remains hidden behind it. Only the integration of the directional variation of C , the dynamics of the photon and the fluid geometry of space-time makes it possible to reconstruct a more accurate vision of the real universe.

The distance from Planck

Minimum directional granularity

After examining how distance is measured, it remains to ask what is the smallest distance that space can sustain. The Planck distance is traditionally the smallest significant physical scale, below which the classical notions of space and geometry cease to be valid. It is defined by:

$$l_P = \sqrt{\frac{\hbar G}{c^3}}$$

and represents the scale at which the quantum effects of gravity become significant. However, this definition is based on external constants, not on an internal structure of space. Directional geometry offers a complementary interpretation: Planck distance represents the minimum directional granularity, the smallest possible internal separation between two distinct directions within a domain.

In a geometric domain S , the minimum granularity δ is not a spatial length but an internal directional distance. If two internal directions d and d' belong to the directional space $D(S)$, then:

$$\|d - d'\| \geq \delta$$

There is therefore a directional distance below which no new direction can be defined. If δ corresponds to the Planck distance, then $\delta = l_P$, which becomes the fundamental directional unit. This granularity is not imposed by matter or fields, but by the directional structure itself.

Maximum density and exponential subdivision

Minimum granularity imposes maximum directional density:

$$\rho_{\max} = \frac{1}{\delta}$$

and, if $\delta = l_P$, $\rho_{\max} = 1/l_P$. When this density is reached, the domain is saturated: no new internal direction can be added, even if the domain tries to increase its internal complexity.

In Exponential Division, each directional level is defined by $|D_k| = |D_0|^k$, and the associated directional density is $\rho_k = |D_k| / \text{Vol}(S)$. It grows exponentially, independently of the geometric volume of the domain. This growth cannot continue indefinitely: saturation occurs when $\rho_k = \rho_{\max}$, i.e., if the Planck distance is the minimum granularity:

$$\frac{|D_0|^k}{\text{Vol}(S)} = \frac{1}{l_P}$$

This equation determines the maximum level of subdivision:

$$k_{\max} = \left\lfloor \log_{|D_0|} \frac{\text{Vol}(S)}{l_P} \right\rfloor$$

The Planck distance thus sets the maximum level of the directional hierarchy. Before l_P , exponential subdivision is possible; at l_P , it ceases; beyond that, the internal structure is saturated. At this threshold, the internal directional space is completely filled, the structure becomes incompressible, and directional coherence reaches its maximum: any attempt at subdivision would violate the minimum granularity. The Planck distance marks the transition between a phase of exponential growth and a phase of directional stability, the boundary between a subdivisible domain and a saturated domain. It becomes a threshold of directional coherence, analogous to an internal quantum boundary, and the precision, localization, and measurement limits of quantum physics appear as reflections of the internal structure of space rather than external fluctuations. It is a structural property of directional space.

The black hole as a test

Directional geometry makes this hypothesis testable. A black hole is the most inwardly dense geometric object, a compact domain S whose directional density naturally reaches $\rho = \rho_{\max}$. If the Planck distance is really the minimum granularity, the saturation of a black hole must occur exactly when $\rho = 1/l_P$. The Planck distance is correct if the saturation appears at the exact threshold where no new internal direction can be added; if it appears before or after, the actual granularity is different, and the Planck distance must be re-evaluated. Saturation manifests itself as a minimum radius for a given mass, a maximum directional density, and the impossibility of adding new directions. Black holes are the only objects that naturally reach the maximum density and push the internal geometry to its limit: a cosmic instrument to check the Planck distance.

This saturation also sheds light on the growth of black holes. When a black hole absorbs matter or energy, its internal volume increases, $\text{Vol}(S) \rightarrow \text{Vol}(S) + \Delta V$, and the directional density temporarily decreases:

$$\rho = \frac{|D_{k_{\max}}|}{\text{Vol}(S) + \Delta V} < \rho_{\max}$$

The black hole stops being saturated, and a directional margin appears. To regain its saturated state, it generates new directions through Exponential Division:

$$D_{k_{\max} + 1} = \bigcup_{d \in D_{k_{\max}}} \Delta(d)$$

The internal structure reorganizes until $\rho = \rho_{\max}$, saturation being restored to a higher directional level. This reconstitution results in an increase in the radius, $R \rightarrow R' > R$, necessary to maintain the maximum density in a domain whose volume has increased. The growth of a black hole is thus a directional compensation mechanism: absorption of matter, increase of volume, decrease of density, generation of new directions, increase of radius.

If the Planck distance is confirmed, the minimum granularity is validated, the internal structure of space is quantized, the Exponential Division has a real physical limit, and quantum physics and internal geometry come together. In an expanding universe, desaturation occurs continuously, reactivating the Exponential Division and generating new directional levels up to this threshold.

Summary

This chapter has described a universe where nothing is static. Space-time is a rotating fluid whose confinements are vortexes; gravity is the living distortion of this fluid, amplified by dynamic mass, energy and directional voltage, to the point of reducing the real distance. Time is universal, but its flow slows down where geometry contracts, and only clocks whose cycles expand with it, those of cyanobacteria, preferably associated with lasers in a photonic-biological clock, follow it without drift. Atoms and photons, invariant, do not expand with the metric: from this shift arises the dual nature of light, internal constant C_0 for the photon, apparent velocity C_v for the observer. The result is a false estimate of distances, images, spectra and cosmic shapes, a visible universe distorted by space-time lensing, and, at the end of the exponential subdivision, a Planck distance conceived as the minimum directional granularity that the saturation of black holes allows to test.

Chapter 5 — Light, Photon and C Speed

Light occupies a singular place in directional physics. It is both the witness by which we know the universe and the most bare structure that energy can adopt: a string freed from its confinement, vibrating, traveling through space-time without ever expanding. This chapter follows the photon from its birth to its cosmic journey. We will first see how it is emitted, what mass it carries and why this mass escapes direct measurement. We will then examine the dual nature of velocity C , constant for the photon and variable for the observer, then the way in which distances should be calculated when proper time expands. Finally, we will discover how the speed greater than C , far from contradicting the constancy of the photon, becomes a geometric consequence of a living space-time, and how this geometry paves the way for the superluminal propulsion of dense matter sphere ships.

1. The birth of the photon: a liberated string

1.1 Directional energy and its internal structure

In directional physics, the equation $E = M \cdot c^2$ does not represent a fixed relationship between mass and energy. It expresses the total amount of directional energy contained in the internal structure of a particle. This structure is not homogeneous: it is composed of strings, internal physical units each with its own coherence, dynamic orientation and directional tension that contributes to the equivalent mass of the particle.

A string is therefore not an abstract geometric object. It is a directional energy reserve, an internal channel where coherence is maintained and redistributed according to interactions. The mass of a particle is not a fixed block: it results from the sum of the internal directional tensions of its strings. A massive particle thus appears as a directional confinement containing a central directional core, a set of vibrating strings and an internal distribution of tension.

At the base of the entire directional structure, there is only one reality, energy. Strings and confinements are neither particles nor logical symbols: they are forms of energy, both expressed by the relation $E = M \cdot c^2$. The string represents vibrational energy, an active tension capable of expanding, contracting, and transforming. Confinement represents geometric energy, a stabilized structure capable of capturing, containing, or releasing this tension. The mass of a particle is then the sum of these two contributions:

$$Mc^2 = E_{\text{corde}} + E_{\text{confinement}}$$

1.2 Emission as a division of the energy of a string

When a photon is emitted, it is neither an abstract phenomenon nor a simple energy transition. It is an actual division of the internal energy of a string. A string reaches a reorganization threshold and releases a fraction of its energy; this fraction breaks off, acquires its own directional coherence and becomes the photon, while the remaining string retains reduced energy, modified equivalent mass, and adjusted internal orientation.

This division is not random. It follows a precise directional logic: the string splits into two distinct states, one retaining the main internal coherence, the other becoming a photon with its own dynamic orientation. The photon is therefore not an entity appearing out of nowhere, but a coherent portion of the string, detached and stabilized in a specific direction. The string then loses a measurable amount of energy, which results in a decrease in its internal tension and therefore in its equivalent mass. The emission of a photon necessarily leads to a change in the mass of the particle, in accordance with $E = M \cdot c^2$.

The equation must therefore be considered fractional, dynamic, and redistributable. If the string divides into n fractions, only one of these fractions becomes the photon, while the others remain in the internal structure. The energy distribution is written:

$$E_{\text{corde}} = \frac{Mc^2}{n}$$

where n is the number of internal divisions resulting from the emission. This expression does not arbitrarily modify Einstein's equation: it complements it by describing how energy is actually distributed in the structure of a particle, and the internal mechanism that relates energy loss to mass loss. Directional division is a consistent, measurable internal process that explains why a particle's mass decreases after a photon is emitted. It agrees with internal string dynamics, directional saturation, and geometric models such as dark spheres.

1.3 The photon, energy that has become autonomous

At the end of this division, the photon is an autonomous unit, endowed with its own dynamic orientation. It does not emerge as light in the classical sense: the particle literally releases one of its confined strings. This released string becomes a photon, a voltage vector, a directional wave, an object in perpetual motion. It no longer has a structured directional nucleus; its internal voltage is extremely low but not zero, and its directional frequency is maximum.

Energy thus ceases to be a uniform block and becomes an architecture capable of fragmenting, propagating and reorganizing itself. Photonic emission is the moment when this architecture is revealed: an internal structure, hitherto confined, escapes and begins its journey at maximum speed.

2. The mass of the photon

2.1 A mass of tension, without rest

The photon is not, in this framework, a massless particle. It is a liberated string whose internal tension, minimal but real, produces an infinitesimal mass. This mass is not intrinsic: it is a dynamic directional tension, defined by the vibration of the string, the directional frequency, the propagation at maximum speed and the absence of internal confinement. It exists only in motion.

This is why the photon has no mass at rest: it never exists at rest. Its mass is a kinematic mass, never a static inertia; it is, according to the author's formula, a mass in perpetual motion. It is expressed as a directional energy mass, proportional to the frequency of the photon, its internal voltage and its energy. The relation $E = E_1 + E_2 = M \cdot c^2$ shows that mass is a sum of directional voltages; the photon, the unit of liberated voltage, therefore has an emergent mass of the same nature.

2.2 The mass of a single confined rope

The complete formulation of this mass is based on the counting of strings. If a particle has a total mass M and contains N confined strings, the mass provided by each string is:

$$m_{\text{corde}} = \frac{M}{N}$$

This value represents the fundamental unit of directional mass in a confinement. Since the emission of a photon releases exactly one string, the photon inherits this mass:

$$m_{\text{photon}} = m_{\text{corde}} = \frac{M}{N}$$

and its energy is written as $E(\text{photon}) = m(\text{photon}) \cdot c^2$. The fundamental principle can then be stated as follows: the mass of a photon is equal to the mass of a single confined string, measurable only by a roundabout means. This mass is infinitesimal, dynamic, proportional to the internal structure of the original particle, and impossible to measure at rest.

2.3 Why Direct Measurement Is Not Possible

The mass of the photon escapes any direct measurement for several converging reasons. It is too small to influence an instrument, too fast to be isolated, too dependent on the frequency and too linked to the propagation itself. The photon never stops, its internal confinement has disappeared, its mass is distributed along a vibrating string, and the measuring instruments require a state of rest that the photon does not know. Its mass is therefore real, but inaccessible by direct measurement: it exists only as a dynamic voltage, never as static inertia.

2.4 The backdoor measure

However, directional physics proposes a method for determining this mass, based on the analysis of confinement. We do not measure the photon itself, but the particle that emitted it, and we reconstruct the mass of the photon from the structure of the confinement. The approach follows four steps. First, we take a confined particle whose total mass M is known and measurable. We then determine the number N of confined strings, defined by its directional structure. We then calculate the mass of a confined string, $m(\text{string}) = M / N$, which is the mass of a unit of internal tension. Finally, we identify the released string with the photon: since the particle releases exactly one string, $m(\text{photon}) = m(\text{string})$. According to the author, this is the only coherent method in the directional framework.

2.5 Photon gravity and black hole capture

The existence of this mass finds indirect evidence in the gravitational behavior of light. A black hole can capture photons; classical physics explains it by the curvature of space-time. Directional physics explains it by the directional tension of the photon, its minimal but real mass, its sensitivity to extreme gradients, and the collapse of directional geometry near the horizon, with the total distortion of the directional flow around the black hole. A photon is captured because its freed string still carries mass: even infinitesimal, it is sufficient to interact gravitationally. This explanation does not contradict classical physics, it extends it.

2.6 What directional mass explains

The directional mass of the photon accounts for the gravitational deflection of light, the capture of photons by black holes, radiation pressure, energy dependence on frequency, wave-particle duality, and the coherence of electromagnetic propagation. It unifies mass, energy, voltage,

frequency, confinement geometry, and motion. It establishes the photon as a real physical object with an infinitesimal mass, not as a mathematical abstraction.

3. The Constant and Variant C

3.1 An apparent paradox

The speed of light, denoted C , is traditionally considered an absolute constant. However, when we observe the actual structure of space-time and the way an observer perceives distances and durations, a paradox appears: C is both a constant and a variable. Directional physics solves it by a simple duality. For the photon, C is a universal constant. For an observer whose proper time expands, whose directional space stretches and whose metric is distorted, the observed speed of the photon is no longer the real velocity: it becomes a value dependent on its temporal and spatial environment, and C becomes a directional variable. C is thus a local constant and a global variable.

3.2 The constant: the directional invariance of the photon

The actual velocity of the photon is an absolute constant. It does not depend on gravity, the density of space, the dilation of time, or directional metrics. The photon retains its structure, its local frequency, its directional rhythm and its internal invariance. It is the only physical constant that does not expand, contract or deform, independent of the observer and the environment.

Even if space stretches, if time slows down, and if the metric expands, the photon travels the same local distance per second, retains its real velocity, does not change its size, and does not change its structure. This invariance is fundamental: the photon lives in universal time, not in proper time. It does not follow the metric, it passes through it.

The constancy of C is the basis of physical coherence: that of electromagnetic interactions, the stability of quantum phenomena, the directional structure of the universe, and the non-expansion of fundamental objects. If C really varied, atoms would collapse, photons would become desynchronized, distances would become incoherent, and matter would lose its structure. The constancy of C is the cornerstone of physical stability; it is the fixed point in a universe that can expand.

3.3 The variant: the apparent vitesse C_a

The observer never measures the real velocity of the photon. He measures an apparent velocity, influenced by the dilation of his own time, the dilation of his directional space and the deformation of his local metric. The observed velocity is therefore not the real velocity: it depends on the point of observation. It is not C that changes, it is the observer.

When an observer's metric expands, his seconds stretch, his perceived distances contract, and his observed velocities decrease. The photon travels the same local distance without expanding, but the observer sees a longer path, a longer duration, and a lower velocity. To distinguish between the two realities, we introduce the apparent velocity C_a :

$$C = \text{vitesse réelle (constante)}$$

$$C_a = \text{vitesse observée (variable)}$$

C_a depends on the observer's temporal rhythm, the dilation of his space, and the distortion of his metric. This distinction explains why light seems to slow down in certain environments, why distances seem to contract, why atomic clocks drift, and why time measurements become inconsistent. The C variant is not a variation of the photon, but a variation of the observer: C varies in perception, but remains constant in reality.

3.4 The actual route and the observed route

In a dilated space-time, the photon never changes its real velocity, local frequency, directional structure, or size. It passes through the metric without adapting to it. When space expands, the actual distance remains the same, but the perceived distance changes; when the observer's own time expands, his internal processes slow down and his directional perception changes. The observer then experiences more conscious duration in the same universal second, and it is not the photon that slows down.

We can therefore distinguish two realities. The real path is invariant: constant local distance, constant real speed, constant directional structure. The observed path is variable: contracted perceived distance, stretched observed duration, reduced apparent speed. Dilated space distorts the perception of the path, not the path itself, and dilated time stretches the observed duration of the path. The photon is constant, space-time is variable, and the perception of the path depends on the observer.

4. Time and light

4.1 Time as dilation of dimensions

To understand this duality, we must clarify the nature of time. In directional space, time is not an independent dimension, nor an axis, nor a coordinate, nor a line. It is a geometric property that arises from the dilation of space, a variation in the volume of dimensions. When dimensions extend, time accelerates; when they contract, it slows down; when they stabilize, it becomes constant. Time is a consequence of eight-dimensional geometry, not an external parameter.

Time is thus both a universal constant and a local geometry-dependent variable. On the scale of the universe, it flows uniformly, because the dilation of space is homogeneous, which guarantees global temporal consistency. Locally, the dilation varies according to the density of matter, the geometry of dimensions, the presence of extreme fields, and directional saturation, so that time can flow more slowly or faster for some systems.

4.2 Sensitive and insensitive systems

Not all systems react in the same way to this expansion. Biological organisms are sensitive to it: their internal structure is based on chemical cycles, energy transitions and directional processes that expand with space. An organism therefore sees its time slow down when space expands, its internal processes expand and its cycles are prolonged.

Atoms and photons, on the other hand, do not expand. An atom retains its size, internal frequency, and electronic transitions; it does not follow the expansion of space, and its proper time remains constant. A photon retains its velocity, local frequency, and local wavelength, and travels through an expanded space without changing its internal structure. This non-expansion of atoms and photons is what makes measurement possible, and it is what makes the photon a reference.

4.3 Light in an Expanded Space

The dual nature of the speed of light can then be understood geometrically. Let us consider two identical spaces, one of which is dilated. A photon passes first through undilated space, then through dilated space: the actual distance traveled is the same, but the distance observed in dilated space is different, and the photon takes longer observed to pass through it. This is why c is a local constant, an internal property of the photon in its own frame of reference and independent of the expansion of space, and a global variable, dependent on geometry.

5. Calculating distances at speed C

5.1 The Fundamental Principle

In dilated spacetime, the actual velocity of the photon remains constant, but the observed time to travel a distance increases; the perceived distance contracts and the apparent velocity decreases. This phenomenon does not come from the photon, but from the observer's metric. A photon takes longer to travel through dilated space, even if it is moving at a constant speed, and this reality must be taken into account in any measurement of distances from the universe.

5.2 Les relations

The actual distance traveled by the photon is written:

$$D_{\text{réelle}} = C \times t_{\text{universel}}$$

where C is the actual velocity of the photon and $t(\text{universal})$ is universal, undilated time. This distance never changes, even if space expands.

For an observer whose proper time is dilated, the observed duration becomes:

$$t_{\text{observé}} = t_{\text{universel}} \times k$$

where $k > 1$ is the dilation factor of the proper time. The perceived distance is then written:

$$D_{\text{observée}} = C \times t_{\text{observé}} = C \times (t_{\text{universel}} \times k)$$

The observer sees the photon take longer and therefore perceives a distance different from the real distance. The measured speed, in relation to the real distance, becomes:

$$C_{\text{mesurée}} = \frac{D_{\text{réelle}}}{t_{\text{observé}}} = \frac{C}{k}$$

The observed velocity decreases in proportion to the dilation of the proper time.

5.3 Cosmological consequence

Since a photon takes longer to travel through a dilated space-time, it is imperative to take this dilation into account when measuring distances in the universe. The observed cosmological distances are influenced by the metric, the travel times of photons are stretched, the apparent velocity decreases, and the perceived distances can be underestimated or misinterpreted. Ignoring time dilation leads to errors in the evaluation of cosmological distances. Cosmology must therefore integrate this dilation to properly measure the universe: the actual distance is constant, the observed distance depends on the metric, the photon remains invariant and the observer modifies the measurement.

6. Above C speed: a geometric reality

6.1 The limit of C, an oversimplified interpretation

In classical physics, the speed of light is presented as an insurmountable limit: no object, no information, no interaction could exceed it. This assertion is based on a simplified view of space-time, a neutral, immobile framework, devoid of twisting, rotation or internal deformation, whose underlying assumption is that the metric is fixed. In a directional universe, this hypothesis collapses. The metric is alive: it expands, contracts, twists, fragments, reorients itself.

C is therefore not a cosmic limit. It is the internal velocity of the photon in an undistorted space-time. As soon as the metric is distorted, the apparent speed of light, denoted C_v , varies, modifying the trajectory, the angle of arrival, the observed distance and the perceived speed of galaxies:

$$C_v = C_0 f(g_{\mu\nu})$$

where $f(g_{\mu\nu})$ encodes the metric deformation. The speed of light is a local property of the geometry traversed. The speed greater than C is not an exceedance of C: it is a geometric consequence of a living space-time, where the actual distances differ from the luminous distances.

6.2 Separation Rate and Closing Rate

Consider two photons that are moving away from each other. Each advances to C in its own frame of reference, and the distance between them increases to:

$$v_{\text{espacement}} = C + C = 2C$$

This speed greater than C is not an exceedance of C. It is a relative speed, a spacing speed, a geometric speed. Relativity does not prohibit a distance from changing faster than C; it only

prohibits an object from exceeding C locally. The same principle applies to approaching: two photons moving towards each other reduce their distance to $2C$.

An observer moving at C towards a galaxy that is rushing towards it reduces the distance to a speed greater than C . Its internal speed is C , the galaxy's internal speed is its proper directional velocity, and the distance reduction is:

$$v_{\text{réduction}} = C + v_{\text{galaxie}}$$

If the galaxy approaches $0.00037C$, like Andromeda, then $v(\text{reduction}) \approx 1.00037C$: the distance reduces faster than C , without any violation. Superluminal velocity is a relative velocity, not an absolute velocity; it is a property of distance, not a property of the object.

6.3 Live Metric Amplifies Speed

In a directional universe, the spacing or approaching velocity can be much higher than $2C$, because the living metric modifies the apparent speed of light C_v , the directional trajectory, the angle of arrival, the local density, the proper time, and the internal geometry. In a contracted region, $C_v > C$; in a dilated region, $C_v < C$. The spacing velocity becomes $v(\text{spacing}) = C_v + C_v$ and can reach $3C$, $5C$, or $10C$ depending on the geometry traversed.

The mechanism is that of dilation and contraction. As the metric expands, the proper time stretches, the directional density decreases, the light path lengthens, and C_v decreases. As it contracts, the proper time tightens, the directional density increases, the light path straightens, and C_v increases. The living metric is a natural superluminal velocity amplifier.

7. The Directional Geometry of Space-Time

7.1 A space-time that is not a neutral framework

In classical physics, space-time is a passive fabric, a stationary frame where objects move and distances are measured. In a directional cosmology, it is a living structure, endowed with an internal orientation, a directional tension, a global rotation, a capacity for expansion and contraction, a geometric twist and a variable metric. Geometry is not a setting: it is the main actor in cosmic dynamics.

The directional metric is denoted $g_{\mu\nu}(x^\alpha, \tau, \Theta, t)$, where x^α is the position in spacetime, τ the local directional voltage, Θ the geometric orientation, and t is cosmic time. It determines the apparent speed of light C_v , the path of the photons, the local density, the directional curvature, the observed distance, and the relative velocity between two objects. The velocity greater than C is therefore not a dynamical phenomenon, but a geometric phenomenon.

7.2 Twisting, Inversions, and Shortcuts

Directional torsion is defined by:

$$T_{\mu\nu} = \partial_\mu g_{\nu\alpha} - \partial_\nu g_{\mu\alpha}$$

It produces position inversions, image duplications, extreme deviations, and cosmological illusions. In a region with high torsion, the actual trajectory of a photon can be much shorter than its observed light path, and the relative velocity can then exceed $2C$ without any violations.

7.3 Cosmic rotation and propulsion of black holes

The global rotation of the universe adds a directional component:

$$v_{\text{rotation}} = r \Omega$$

It distorts geometric axes, modifies trajectories, amplifies centrifugal force, increases the apparent velocity of galaxies, and accelerates the reduction or spacing of distances. The relative velocity becomes $v(\text{relative}) = C_v + C_v + r \cdot \Omega$.

Supermassive black holes, on the other hand, distort the local metric according to $\Delta g_{\mu\nu} = S^\alpha \cdot \partial_\alpha g_{\mu\nu}$. This deformation creates directional tension, internal propulsion, and geometric acceleration, the directional velocity of which is:

$$v_{\text{propulsion}} = \frac{P}{m}$$

The total speed between two objects can then reach:

$$v_{\text{totale}} = C_v + C_v + r \Omega + \frac{P}{m}$$

This result naturally exceeds C , without ever violating the internal velocity of the photon.

7.4 The visible universe is not the real universe

The speed greater than C is the direct signature of the actual geometry of the universe. It proves that light does not show the actual distance, that the observed position is a projection, that the observed velocity is an illusion, and that living metric distorts everything that is measured. Light takes detours: its trajectory is distorted, the luminous distance is an illusion, and shorter paths exist in space-time. The visible universe is never the real universe; light does not show the cosmic structure, it shows the deformation it undergoes as it passes through it.

8. Going beyond C without violating C

8.1 The principle

The central principle of this physics can be summed up in one sentence: you can exceed C without ever violating C . In a distorted metric, the actual speed of an object can exceed C without ever exceeding the actual velocity of the photon in its own metric. C is exceeded in the observer's metric, not in the photon's metric. The photon remains the absolute reference: it retains its real velocity, structure, directional rhythm and invariance, does not expand, does not contract, does not slow down. C remains the local constant of the photon, while the observer lives in a metric that can be stretched, contracted, slowed down or accelerated.

8.2 Distortion as a Speed Amplifier

When spacetime contracts in front of an object, as in a warp bubble, the actual distance to be traveled decreases. The object travels less real space in the same universal time, which increases its true speed in the observer's metric:

$$v(\text{actual}) > C(\text{observed})$$

This phenomenon is identical to that of cosmic expansion: galaxies move away at speeds greater than C without ever violating the local velocity of the photon, because it is space that expands. Metric distortion makes it possible to exceed C without ever exceeding C .

8.3 The Role of Dilated Time

If the observer's own time expands, his seconds get longer, his observed durations increase and his perception of velocities changes. The observed speed is written:

$$v_{\text{observée}} = \frac{D_{\text{réelle}}}{t_{\text{observé}}}$$

and if $t(\text{observed})$ increases, then $v(\text{observed}) < v(\text{real})$. An object can thus exceed C in physical reality while remaining less than C in observed reality.

8.4 Local and Global

In a warp bubble, the space in front of the object contracts, the space behind it expands, the internal time becomes out of sync with the external time, and the light bends, becoming invisible. The object never exceeds C locally, but exceeds C globally. This is exactly the principle of cosmic expansion: locally, nothing exceeds C ; globally, distances can grow faster than C . An object can travel more real distance per universal second than the photon travels in the observer's metric; this overshoot is not physical but geometric, made possible by the distortion of the metric. The universe is not limited by C : it is limited by the local geometry of the photon, and this geometry can be changed. We exceed C in geometry, never in photon physics.

9. Superluminal expansion

9.1 A Separation Speed

In classical cosmology, expansion is interpreted as a speed of distance from galaxies. Directional physics sees this not as a dynamic velocity of an object, but as a geometric velocity, a velocity of spacing between two regions of space-time. If two galaxies A and B move away from each other, each at an internal velocity limited by C , the distance between them can nevertheless increase at a speed greater than C :

$$v_{\text{expansion}} = v_A + v_B$$

If each is moving away at a speed close to C , $v(\text{expansion}) \approx 2C$. Superluminal expansion is therefore natural, geometric, and inevitable. It does not mean that galaxies are passing C , but that the distance between them is increasing faster than C .

9.2 Rotation, Propulsion, and Metric

Cosmic rotation pushes galaxies outwards, amplifies their apparent velocity, increases the speed of spacing, distorts light trajectories, and modifies redshift: $v(\text{expansion}) = v_A + v_B + r \cdot \Omega$. Each galaxy also has a supermassive black hole that distorts the local metric, creates directional voltage, and generates internal propulsion, so that:

$$v_{\text{expansion}} = v_A + v_B + r \Omega + \frac{P}{m}$$

Galaxies therefore do not move away just because space expands: they are propelled by their internal geometry.

The live metric in turn accelerates the observed expansion. As it expands, the proper time stretches, the directional density decreases, the light path lengthens, the redshift artificially increases, and the expansion appears faster. As it contracts, the redshift artificially decreases and the expansion appears slower.

9.3 Acceleration without mysterious energy

The acceleration of the expansion is not due to a mysterious force, but to the combination of three directional motors: the natural distance of galaxies ($v_A + v_B$), cosmic rotation ($r \cdot \Omega$) and the directional propulsion of black holes (P/m). The total velocity can exceed C , $2C$, or even more, without ever violating the internal velocity of the photon. The expansion accelerates because the universe has internal dynamics, not because an unknown energy pushes it: the universe exceeds C because it is directional, alive, rotating, and propelled by its own geometry.

10. VS®: Superluminal Directional Propulsion

10.1 The Ship Principle

The VSMD, Dense Matter Sphere Ship, is a directional architecture designed to go beyond the classical limits of propulsion by directly manipulating the space-time metric. Unlike traditional engines, which seek to increase speed in a fixed space, it is based on a fundamental principle: it is not the ship that accelerates, it is the space-time that contracts around it.

At the heart of the VSMD are the Dense Matter Spheres (GDS), structures rotating at speeds close to C . This extreme rotation generates immense directional inertia, local distortion of the metric, contraction of space in front of the ship, expansion of the space behind, and desynchronization of internal time. The proper time of the SMD slows down: the SMD experiences less internal time for the same universal second. In its own time, the actual distance to be traveled decreases, the effective speed increases, and the ship exceeds C in geometry without ever violating the constancy of the photon. The journey is not about increasing the speed, but about decreasing the actual distance by reconfiguring the local metric. The VSMD exceeds C without ever touching C : it crosses the limit through geometry, not physics.

10.2 From GDS to Dark Spheres

A Dense Matter Sphere is a structure whose density approaches that of a black hole without crossing the gravitational collapse threshold. It represents the limit state of matter before the formation of a horizon, and produces internal directional tension, relativistic inertia, local deformation of the metric, slowing of proper time, and contraction of the surrounding space. It is a black hole proto-geometry, controlled and stabilized.

A Black Sphere is the advanced version: its density reaches the threshold of the horizon, but its geometry is controlled, oriented, stabilized along a precise axis. Unlike a natural black hole, it does not collapse, does not devour matter, does not produce singularity and does not generate gravitational chaos. It is a black hole without singularity, used as a geometric engine. The SMD is the stable version and the step before the black hole; the Black Sphere is the extreme version, the controlled black hole. Both share directional density, internal tension, metric deformation, slowing down of proper time and contraction of space, but the Dark Sphere amplifies these effects: stronger contraction, even slower proper time, more distorted metric, even shorter real distance.

10.3 Slow time, the key to propulsion

In an SMD or Dark Sphere geometry, the space in front of the spacecraft contracts, the space behind it expands, the actual distance decreases, the proper time slows down, and the effective velocity increases:

$$v(\text{effective}) > C(\text{observed})$$

without ever violating $C(\text{photon})$. Superluminal propulsion comes from geometry, not speed. Extreme rotation, extreme density, and directional tension slow down proper time, so that $t(\text{SMD}) < t(\text{universal})$. This slowing down makes it possible to travel more real distance in less internal time, to increase effective velocity, and to exceed C in geometry. Slowed time is the directional signature of black hole propulsion.

10.4 The Self-Amplified Cycle

When an SMD rotates at a speed close to C , its relativistic factor increases, its effective mass increases, its directional inertia explodes, and its internal voltage increases:

$$m_{\text{effective}} = \gamma m_0$$

where γ increases with velocity. This effective mass amplifies the distortion of spacetime, directional contraction, slowing down of proper time, and reducing actual distance. The faster an SMD goes, the more it warps spacetime, and this deformation acts as a geometric accelerator that carries it to speeds close to C , and then beyond in geometry. The process forms a self-amplified directional cycle: the SMD rotates faster, its effective mass increases, the distortion increases, the actual distance decreases, the effective velocity increases, and the SMD can exceed C in geometry.

10.5 Cosmological Shortcuts

Because light takes detours, an SMD/VS[®] superluminal spacecraft can follow the actual geometry rather than the distorted light path. It can reach a galaxy faster than light, not by passing C, but by taking the actual path, which is shorter than the light path. Superluminal navigation thus becomes a direct consequence of the directional structure of space-time.

11. Black holes, the rotation of the universe, and galaxies

11.1 The Black Hole as a Geometric Machine

The principle that propels VSMD also governs the natural dynamics of galaxies. A black hole is not just a massive object that attracts matter: it is a geometric machine that distorts spacetime in extreme ways. Around a rotating black hole, space-time is driven, the metric is twisted, the dimensions are curved, time is slowed down, and a directional current appears. The central black hole of each galaxy rotates at extreme speed, distorts spacetime, slows down proper time, and drags matter around it. It does not hold the galaxy back: it propels it.

The galaxy does not revolve around it like a planet around a sun. It is carried away by the geometric distortion, just as an SMD drives space into a VSMD. This current acts like a geometric river: the stars do not fall into the black hole, they are transported by the directional flow of space-time. The galaxy rotates because space-time rotates.

11.2 The Rotation of the Universe and the Cosmic Centrifugal Force

The universe is not static. It has a slow but real global rotation that drives dimensions, local metrics, cosmological structures, and directional currents. This rotation is not a mechanical movement, but a geometric rotation inscribed in the very structure of space-time. Like any rotation, it generates a centrifugal force, which does not act on physical objects but on the metric itself. This cosmic centrifugal force pushes galaxies outwards, increases their speed, amplifies expansion, and reinforces the local distortions created by black holes. It explains why galaxies move away, why expansion accelerates, and why the observed speeds are so high.

The two effects overlap: the black hole twists the metric locally and propels the galaxy locally, while the universal rotation twists it globally and creates a cosmic current that drives it along as it expands. Galaxies are propelled by two engines, a local engine, the black hole, and a cosmic engine, the universal rotation.

11.3 Why Galactic Speeds Are High

In standard physics, galaxies spin too fast for the amount of visible matter: stars would have to escape, arms would break apart, and dark matter was invented to fill this inconsistency. Directional physics sees this as a mistake from the outset, that of assuming that gravity is the only cosmic force at play. Galactic velocities result from three combined effects: the directional distortion of the central black hole, whose geometric current drives the galaxy; the global rotation of the universe, which adds centrifugal thrust; and the directional expansion of cosmic metrics, under the combined effect of black holes and rotation. Galaxies move fast because space-time carries them, not because an invisible mass holds them back. Universal rotation explains

centrifugal force, black holes explain local propulsion, directional metric explains expansion: dark matter has no role, and expansion is a directional phenomenon independent of dark energy.

11.4 The Great Attractors

A Large Attractor is not a mysterious region filled with invisible matter, nor a hidden cluster, nor a gravitational anomaly: it is a supermassive black hole located on a cosmic scale. Much more massive than those of galactic centers, it distorts the metric over millions of light-years, creates giant directional currents, and influences the trajectory of hundreds of galaxies. It doesn't just attract matter: it pulls on space-time itself, bending dimensions, slowing down proper time, and creating directional flow. It acts as a cosmic geometric pump.

The galaxies do not fall towards it, they are transported by the distortion of space-time: the Great Attractor pulls space-time, space-time pulls the galaxies, and the galaxies follow the flow. This is not a classic gravitational force, but a directional geometric force. Interacting with the rotation of the universe, which pushes galaxies outwards, the Great Attractors pull space-time towards them, the galaxies follow complex trajectories and the flows increase. They are the directional anchors of cosmic rotation and stabilize large-scale geometric currents.

11.5 A coherent directional system

SMDs demonstrate that extreme density distorts the metric, that rotation slows down proper time, that effective mass increases with velocity, and that effective velocity can exceed c in geometry. Black holes are natural engines of the universe, pulling on space-time, creating directional currents, propelling galaxies, structuring galactic arms, and slowing down proper time on a large scale. The Great Attractors are the directional anchors of the cosmos, and the rotation of the universe is a complementary global engine. Together, they form a coherent system that explains the propulsion of galaxies, the expansion of space-time, and superluminal velocities without violating the constancy of the photon: the universe is not governed by invisible forces, but by geometry, and space-time is a dynamic fluid with dense structures as the engines.

12. Light as the language of simulation

12.1 Strings, Containments and Quadrannary Mode

The energetic nature of the photon finds an extension in the photonic simulation of the directional universe. Its first layer is the quadrinaire mode, a living energetic logic based on the two identities of the string and the confinement. A string is 1 and a confinement is 0, but each has a positive and a negative pole, which allows dynamic transitions: a string can vibrate towards 1, expanding, or contract towards 0, in compression, and can become a confinement because it is an energy capable of stabilizing; a confinement can remain at 0, stable geometry, or rise towards 1, activation, and can become a string because it is an energy capable of freeing itself. These inversions are not numerical operations, but energetic transitions that reflect the internal redistribution of mass and directional tension.

This results in four real directional states: chord-0 (internal vibration), chord-1 (external vibration), confinement-0 (stable geometry) and confinement-1 (geometric activation). This

quadrinaire is reversible, alive, and directional. Unlike binary, a language of storage, it is a language of transformation, capable of representing matter, antimatter, transitions, inversions and internal tensions. It also offers a natural language for encoding DNA, the four bases of which correspond to the four states: A to chord-1 (active vibration, expansion), T to chord-0 (internal vibration, contraction), C to confinement-1 (geometric activation) and G to confinement-0 (stable geometry). From this perspective, the release of a string from its confinement, which gives rise to the photon, is the elementary transition of which the quadrinaire makes its alphabet.

12.2 The Octonary Mode and Time

The octonary mode is the second layer: it encodes the geometry of the universe. The dimensions are not those of a classical space (X, Y, Z, T), but eight fundamental directions from a cube, a central point and eight segments connecting this point to the eight vertices. These segments are independent, directional, orthogonal and geometrically inevitable. The cube is divided into eight internal pyramids, so that the dimensions are not abstract axes but directional volumes, each of which is also a zone of photonic propagation. The fusion of the quadrinar and the octonary causes energy to move in the dimensions, the dimensions to expand according to the energy, time appears as a consequence and matter becomes a directional structure.

A sphere placed in the center of the cube represents the potential dimensions, i.e. the set of directions accessible from the central point: each point on its surface corresponds to a possible orientation. When it expands, space can bend, deform, fractalize and reorganize. Without limit, these dimensions would become infinitely fractals, matter could compact endlessly, and the expansion of a black hole would become impossible to model; Planck's constant therefore fixes the smallest directional unit, the minimum granularity of space, and the lower limit of potential dimensions. A black sphere is then an object where the potential dimensions are saturated: all directions are filled, the inner sphere reaches its maximum expansion, and space is saturated with directional energy. It is neither a vacuum nor a hole, but a volume where the directional density reaches its limit, which explains the extreme curvature, the lack of stable trajectories, and the impossibility of any internal expansion.

12.3 The Photonic Lattice and the Pure Photonics Mode

The photonic network is the infrastructure that manages, stabilizes and propagates the simulation. Unlike electronic networks, it transmits the light itself, with its geometry, intensity and directional cycles. Each photonic computer is a light node whose capacity is based on the ability of light to propagate, divide, recombine, expand and saturate, within an internal cavity where it is manipulated. Connected by optical fiber, the nodes synchronize their cavities, align their intensity cycles, merge their luminous fluxes and balance their directional gradients. This synchronization is based on the alignment of light phases at the attosecond scale, the stabilization of intensities, the resonance of internal cavities and the fusion of directional cycles. The network then forms a distributed processor, a collective luminous organism, endowed with collective behavior, self-stabilization, autonomous propagation and directional expansion capacity. It provides dimensional consistency, repairs inconsistencies by redistributing energy, and provides

the power needed for extreme phenomena such as dark spheres, dimensional saturations, and fractal collapses.

At the top of the architecture is the pure photonic mode, where light is no longer just a support: it becomes the operation itself. It varies in intensity, overlaps, divides, recombines, saturates and expands, through continuous operations rather than discrete values. An exponent is not a number but a luminous intensity: low for a low exponent, high for a high exponent, saturated for an extreme exponent. The continuity, expansion and saturation of light make it possible to manipulate infinity, saturation representing a form of stable infinity that can be used in directional calculations, which gives access to infinite series, infinite expansions, asymptotic limits and dimensional saturations.

12.4 Constants as photonic states

In this mode, the physical constants are not fixed numerical values but stable photonic states, obtained by particular configurations of light. Planck's constant is represented by a stable minimum intensity, which defines the granularity of space and prevents fractal collapses. The speed of light is represented by maximum directional propagation, which sets the upper limit of geometric transformations. Other system-specific constants are represented by stable photonic cycles, fixed intensities, and invariant internal geometries. The pure photonic mode works in superposition with binary (compatibility), quadronary (energy), and octonary (geometry), and is the apex of the directional architecture. Since constants are stable states, they can be adjusted: the granularity of space, the speed of propagation, internal energy cycles, and dimensional limits allow for stable, extreme, accelerated, or slowed environments.

12.5 Matter, Antimatter, and String Release

The same logic of strings and confinements illuminates matter and antimatter. Matter corresponds to a positive directional coherence, with chords in a positive state (1), internal stability and regular propagation; antimatter corresponds to an inverted coherence, with strings in a negative state (0), inverted confinements and an opposite internal geometry. It is not unstable by nature: it is simply oriented in the opposite direction. Their coexistence is necessary for the complementarity of the poles, for the directional conservation of tensions (all expansion has a contraction, any activation has a stabilization) and for the completeness of the quadriary. When a mass of matter meets an equivalent mass of antimatter, the internal poles neutralize each other and the confinements cease to hold the strings: this is the dimensional collapse, an implosion followed by an explosion when the free strings, which propagate in all potential directions, reconfine themselves and restore the directional volumes. The resulting rapid expansion is comparable to a local Big Bang. Here, on a cosmic scale, we find the founding gesture of the photon: strings torn from their confinements.

Conclusion

The photon is a liberated chord, resulting from the internal division of a particle's energy, endowed with an infinitesimal directional mass that exists only in motion and that only a roundabout method, based on the M/N ratio, can determine. Its real velocity C is the fundamental

directional constant, a fixed point in a universe that can expand, contract and twist. The observer, on the other hand, lives in a deformable metric and measures an apparent velocity C_a or C_v that depends on his own time and the geometry traversed: C is a local constant and a global variable, and the cosmological distance must be calculated taking this expansion into account.

From this duality comes the key to the chapter: exceeding C is a property of the metric, not a violation of the photon's velocity. Two opposing photons deviate at $2C$, the living metric can increase this speed to $3C$, $5C$ or $10C$, the cosmic rotation and the propulsion of black holes add their components to it, and the expansion of the universe itself is a spacing velocity that exceeds C without any object doing so locally. The VSMD draws its technical consequence from this: by slowing down its own time and contracting the space in front of it, it decreases the real distance and crosses the limit through geometry, following the real path rather than the distorted light path. The light does not show the cosmic structure, it shows the deformation it undergoes as it passes through it; behind it is revealed a superluminal, living and geometric cosmos, which the next chapter will explore further.

Chapter 6 — Propulsion, Fusion and Directional Reactors

The previous chapters have established the foundations of directional physics: a particle is a confinement containing vibrating strings, space is a set of dynamic potential dimensions, and mass is not a fixed quantity but a function of motion, tension, and geometry. This chapter shows how these principles translate into technologies. It follows a deliberate progression from the most familiar object, the rocket, to the deepest structures of matter. It first discusses the rotating directional rocket, then the propulsion by displacement of space inspired by black holes, then the mechanism of nuclear fusion by string migration, and finally the spherical reactor, which applies these laws to the complete transformation of matter and the production of energy.

A common thread connects these four parts: geometry is no longer a submissive framework, it is an active parameter of energy. The shape of the fins determines the mass of a rotating rocket, the saturation of the strings determines the movement of space, the migration of the strings determines the mass of a nucleus, and the sphere determines the stability of a plasma. In each case, the internal dynamics of matter become the driving force.

The rotating directional rocket

A break with the classic conception

Traditional rocket design is based on a simple principle: avoid rotation. Engineers seek to stabilize the trajectory, reduce twisting, and maintain a perfect linear axis. However, this approach ignores a fundamental source of energy: the dynamics of rotating mass.

In a directional reading of physics, rotation is not a defect to be eliminated but a resource to be exploited. When an object rotates on its axis, its effective mass increases under the effect of centrifugal force, its geometry is reorganized and its total energy rises. A rocket that voluntarily

rotates on its axis thus becomes more stable, more coherent and more energetic. It does not undergo rotation: it generates it and uses it to increase its energy, stability and internal coherence.

To achieve this controlled rotation, the rocket must be designed differently. Its ailerons are no longer simple stabilizers: they become helical structures that impose rotation as soon as it takes off. The rocket then becomes a dynamic object, whose mass, tension and energy evolve with movement.

The helical geometry of the ailerons

The fundamental principle of the directional rocket is that the geometry of its ailerons determines its dynamics. The fins of conventional rockets are short and flat, designed to stabilize a linear trajectory. Those of the directional rocket occupy a third of the total length of the craft, and this proportion is not arbitrary. A fin that is too short only produces a trajectory correction, without sufficient aerodynamic torque to turn the rocket as soon as it takes off. A fin that is too long destabilizes the whole and disrupts the linear thrust. A third of the length represents the directional balance: it is long enough to impose a strong but controlled rotation, short enough not to hinder thrust, and extended enough to structure the internal geometry of the rocket. This rule of the third becomes the basis of any directional architecture.

The ailerons are not flat: they are streamlined like a propeller, with an angle of attack calculated to create a rotary movement around the central axis. This profile creates rotational torque from the moment of take-off, gradually increases the rotational speed, stabilizes the rocket by centrifugal force and reorganizes the mass around the longitudinal axis.

The complete design follows a rule of progressiveness. The ailerons are thin towards the top of the rocket and widen downwards, very gradually, without breaking, in order to avoid turbulence and maintain a smooth rotation. The thin part, at the top, reduces air resistance, initiates rotation without disturbing thrust and allows a smooth entry into the aerodynamic flows. The wide part, at the bottom, increases the rotational torque, reinforces directional stability, amplifies the centrifugal force and structures the directional geometry. This progression creates a natural propeller: the ailerons are no longer stabilizers but directional blades, integrated into the structure of the rocket.

Interaction with the airflow

The helical shape profoundly changes the way air circulates around the rocket. The flows are captured by the thin part, accelerated along the progression, then amplified by the wide part and transformed into directional rotation. The air is guided in a spiral, the pressure is distributed in a directional manner and turbulence is reduced. The result is an aerodynamic propeller that imposes a continuous, fluid and stable rotation. The helical geometry thus transforms the air into a directional structure, which stabilizes the rocket throughout its ascent.

Rotation as a source of energy

In directional physics, mass is not a fixed number: it depends on motion, tension, and geometry. When a rocket rotates, centrifugal force stretches the geometry, directional tension increases, effective mass rises, and the total energy increases accordingly. The faster the rotation, the more dynamic mass increases.

The centrifugal force is therefore not a secondary force: it is a mass amplifier. Each particle is pushed outwards, the internal structure tenses, the geometry is reorganized, and this increase in mass leads to a direct increase in energy:

$$E = m_d c^2$$

where m_d is the dynamic mass. Rotation becomes a source of directional energy: it is not a loss, but an energy engine in its own right, which makes it possible to reach energy levels impossible for a linear rocket.

Rotation does not replace propulsion, however: it amplifies it. Linear thrust acts on a higher dynamic mass, internal cohesion allows more tension to be absorbed, directional geometry optimizes airflow, and total energy increases with rotational speed. Propulsion becomes a dual process of linear thrust and rotational directional amplification.

Directional stability

In classical design, stability is based on the absence of rotation. Directional physics asserts the opposite: rotation is a natural stabilizer. When an object rotates on its axis, centrifugal force distributes tensions evenly around the central axis. This distribution creates a directional cohesion that stiffens the structure, increases its mechanical strength, and prevents dangerous deformations. The rocket becomes stronger through rotation, not in spite of it.

A linear rocket is vulnerable to gusts of wind, pressure variations, atmospheric turbulence, and thrust micro-oscillations. A rotating rocket absorbs these disturbances, distributes forces, reduces lateral oscillations, and maintains its directional axis. The rotation acts as a dynamic shield. The helical fins then play a dual role: they impose rotation, and then they guide and stabilize it. Rotation is not instability: it is superior stability, and this directional stability is the foundation of directional propulsion.

Mathematical formulation

The proof distinguishes between two masses: the mass at rest m_0 and the dynamic mass m_d , the rotating mass. The dynamic mass is defined by:

$$m_d = m_0 + \Delta m$$

where Δm represents the increase in mass due to rotation. For a rocket rotating at angular velocity ω with a directional radius r , the classical centrifugal force is:

$$F_c = m_0 \omega^2 r$$

In directional physics, this force is not limited to acting on the trajectory: it increases the effective mass. We write:

$$\Delta m = k \omega^2 r$$

where k is a directional coefficient that depends on the helical geometry of the ailerons, the weight distribution, the internal tension, and the directional coherence. The dynamic mass becomes:

$$m_d = m_0 + k \omega^2 r$$

The total energy is then no longer $E = m_0 c^2$ but:

$$E_d = m_d c^2 = (m_0 + k \omega^2 r) c^2$$

which can be separated into two terms:

$$E_d = m_0 c^2 + k \omega^2 r c^2$$

The first term is the energy at rest. The second is the directional energy generated by rotation.

Helical geometry can be integrated explicitly. By denoting G the geometry, we refine Δm into a function $f(\omega, r, G)$, for example:

$$\Delta m = k(G) \omega^2 r$$

where $k(G)$ increases with the angle of attack of the ailerons, the depth of the helical profile, the directional length (one-third of the rocket) and the quality of the imposed rotation. Geometry thus becomes an energetic parameter. The general form of the directional equation is written:

$$E(\omega, r, G) = m(\omega, r, G) c^2$$

with:

$$m(\omega, r, G) = m_0 + f(\omega, r, G)$$

Mass is a function, energy is a function, and rotation, geometry, and directional tension are integrated into the mass. The rocket no longer has a fixed mass: it has a directional mass, dependent on its motion, and its energy is greater than that of a linear rocket.

Synthesis of directional design

The complete design of the directional rocket is based on four principles: ailerons occupying a third of the rocket, a helical profile imposed by a progression from thin to sea, controlled rotation from take-off, and directional stability reinforced by centrifugal force. Turbulence is no longer endured: the rocket absorbs it, redistributes it and neutralizes it by centrifugal force. Mass is no longer a fixed constant but a dynamic variable, and total energy is no longer limited to energy at rest. This is the birth of a propulsion system that is no longer based solely on linear thrust, but on the living dynamics of rotating mass: a rocket that uses rotation as a motor, as a stabilizer and as an energy amplifier, and which no longer fights dynamics but embraces it.

Directional propulsion and dynamics of black holes

Space as dynamic geometry

The spinning rocket remains thrust propulsion. Directional propulsion in the full sense is based on a more radical idea: space is not a fixed structure, but a set of dynamic potential dimensions, defined by the directional strings of matter. Each particle has a directional structure that determines its internal dimensions, its ability to interact, its local directional density and the way it influences the surrounding geometry. Space is therefore not independent of matter: it is generated, structured and modulated by matter.

Potential dimensions can contract, stretch, reorient, saturate, or shift. This dynamic character is the basis of directional propulsion. When a region reaches an extreme level of directional saturation, its potential dimensions contract, stretch, and reorient, and this internal reorganization not only changes the local geometry, but also displaces the material embedded in that geometry.

Directional saturation and geometric displacement

Directional saturation corresponds to the state where all the internal chords of a region are mobilized. It is denoted:

$$S = \frac{C_{actives}}{C_{totales}}$$

When $S = 1$, the region reaches maximum directional density. This state causes a compression of the potential dimensions, an internal reorganization of the geometry, a directional stretching in the axis of rotation, and the creation of a geometric gradient. This gradient is not a force in the classical sense: it is a reorientation of space itself.

In directional space, matter is embedded in its potential dimensions. If these dimensions move, matter moves with them. The principle is fundamental: moving space is the same as moving matter. A saturated region does not move "in" space: it moves space around it, dragging everything in it. This phenomenon can be observed on a large scale in cosmological structures, where directional geometry directly influences the movement of matter.

The Role of Rotation

Rotation plays a central role. When a saturated region rotates, it stretches the potential dimensions in the axis of rotation. This stretching creates a directional current, a kind of geometric flow that carries geometry, moves matter and creates an overall movement without mechanical reaction. Directional rotation is a natural geometric engine. Here, on a deeper level, we find the driving role that rotation plays in the helical rocket: it is no longer just a mass amplifier, it becomes the source of a current that drives space.

The principle of propulsion

Directional propulsion consists of creating a controlled directional saturation locally, and then using rotation to generate a geometric current that moves space and matter. This displacement escapes classical constraints: there is no reaction, no thrust, no inertial resistance, and no speed limit imposed by moving in space. The ship does not cross space: it carries space with it.

The SMD, controlled directional motor

The heart of such an engine is the SMD, the Dense Matter Sphere. It is a theoretical configuration of extremely dense matter, designed to achieve a high level of directional mobilization. It is not a black hole, because it has neither a singularity nor an event horizon, but it shares several characteristics: a high internal density, a strong mobilization of directional strings, a compressed internal geometry and the ability to generate a directional gradient. The SMD is envisioned as a controlled directional unit, capable of locally producing the geometric effects observed on a large scale in black holes. This is not to say that SMD technology already reproduces this phenomenon, but to examine how the principles observed in black holes inspire a method of displacement where space, and therefore the matter it contains, is driven by a saturated internal geometry.

The dense matter of an MDS contains a high number of internal directional strings. When they are strongly mobilized, the region reaches a directional density:

$$D = \frac{C_{\text{actives}}}{V}$$

where C_{actives} is the mobilized directional chords and V is the internal volume of the SMD. High directional density results in compression of potential dimensions, reduced directional freedom, and increased internal coherence, which is essential for generating a stable geometric gradient.

When a dense region rotates, the internal directional strings align in the axis of rotation. This alignment causes directional stretching:

$$E_r = f(\omega, D)$$

where ω is the angular velocity and D is the directional density. The faster the rotation, the more intense the stretch. It creates a geometric gradient, that is, a variation in directional density in the surrounding space. This gradient acts as a directional flow that does not push matter: it displaces

the potential dimensions in which it is embedded. Space is dragged, matter follows naturally, and displacement requires no mechanical reaction.

A trip without reaction

In this diagram, the material of the ship is embedded in its potential dimensions. If these are reoriented or transported, the ship automatically follows. The mechanism allows movement without thrust, without inertial resistance and without loss of energy by friction. It even allows a potentially superluminal movement, since it is not a local displacement but a geometric transport. The ship becomes a structure embedded in a space that it transports itself.

For an MDS to function as a motor, however, it must maintain internal stability. This depends on the coherence of the directional chords, the regularity of rotation, the constancy of directional density, and the absence of internal disturbances. An unstable MDS would produce a chaotic geometric gradient, unable to generate a controlled displacement. By controlling the directional density, internal rotation, and geometric gradient, one can instead produce a stable and continuous displacement.

The accelerator ring and effective mass

Placed in an accelerator ring, the SMD undergoes extreme rotation that directly changes its internal directional structure. The outer part of the torus moves faster than the inner part; this speed gradient creates a directional energy difference, which induces internal torque on the SMD and forces its internal directional strings to tighten further.

In directional physics, mass depends on the mobilization of the internal strings. Directional energy is therefore converted into effective mass:

$$m_{\text{eff}} = m_0 + \Delta m_{\text{directionnel}}$$

The faster the rotation, the higher the directional tension and the more the effective mass increases. A higher effective mass means more strings mobilized, a greater directional density and a more compressed internal geometry, which strengthens the geometric gradient. The directional stretch becomes more intense, the geometric current stronger and the displacement of space faster. The causal chain can be summarized as follows: rotation in an accelerator ring increases the effective mass, which increases the directional density, which increases the geometric gradient, which increases propulsion. It is the same principle as that of the rotating rocket, transposed from the level of the mechanical structure to that of the internal strings.

Directional black holes, cosmic motors

A black hole represents the most extreme directional state possible. In a region where the density of matter reaches a critical threshold, all the internal directional strings are mobilized simultaneously:

$$S = \frac{C_{\text{actives}}}{C_{\text{totales}}} = 1$$

This total saturation results in maximum compression of potential dimensions, a drastic reduction in directional freedom, perfect internal consistency, and a completely reorganized directional geometry. The internal strings are stretched to the maximum, the directional density reaches its absolute threshold, and the internal geometry becomes rigid and coherent. The black hole is not just a gravitational singularity: it is a saturated directional structure.

Supermassive black holes have gigantic rotational speeds, which increase their directional effective mass, directional density, and ability to move space. Their rotation causes them to stretch directionally in the axis of rotation:

$$E_r = f(\omega, S)$$

with $S = 1$. This stretching reorganizes the potential dimensions, creates a massive directional gradient, and generates a geometric flow capable of driving space, analogous to that of an MDS but on a cosmic scale.

Saturation and rotation combined create a directional curvature. This is not only a distortion of space-time in the relativistic sense: it is an internal reorientation of potential dimensions, which displaces space, drives matter, structures orbits and influences galactic dynamics. Stars do not revolve around the black hole: they are transported by the directional geometry it generates.

The colossal relativistic jets emitted by black holes are interpreted in the same framework. They are areas of extreme directional stretching, geometric vectors expelled by rotation, flows capable of transporting matter and energy. They are the visible manifestation of the directional current produced by saturation and rotation, and show that the black hole does not just distort space: it projects, transports and reorients it.

The movement of galaxies

Supermassive black holes at the center of galaxies generate a massive directional current that drives space, moves matter, structures spiral arms, influences galactic rotational speed, and contributes to the overall dynamics of clusters. A galaxy is a system carried by the central directional engine that is its black hole. Galaxies move like an SMD spacecraft: they are driven by a rotating saturated region.

Black holes and SMDs thus share the same internal dynamics: directional saturation, extreme rotation, directional stretching, geometric gradient, space displacement and the entrainment of matter. The difference is in scale, not in nature. A black hole is a natural cosmic SMD, and an SMD is a miniature, controlled directional black hole. Directional propulsion is therefore not an isolated speculation: it is the technological extension of a real cosmic phenomenon, already at work in the Universe.

Gravity as passive directional propulsion

This correspondence provides a natural explanation for gravity. A mass mobilizes its internal strings and creates a local directional density that reorients the potential dimensions around it.

The surrounding matter does not "fall" towards this mass: it is transported by the directional geometry that this mass generates. Gravity is neither a force in the classical sense, nor a simple passive curvature of space-time: it is a directional displacement of space, to which matter adheres because it is embedded in its own potential dimensions.

Black holes are the most extreme expression of this: their total saturation, combined with intense rotation, generates a current capable of moving space on a large scale, and extreme gravity is simply cosmic directional propulsion. Propulsion by SMD does not imitate gravity: it reproduces, on a small scale, the directional dynamics that produce it. Gravity itself appears as a passive directional propulsion, generated by the density and rotation of the internal strings of matter. The next step in the work consists of formalizing the directional equations, defining the necessary saturation thresholds and establishing the conditions of stability of an operational propulsion, in a physics where geometry is no longer suffered but generated, and where displacement results directly from the internal structure of matter.

Directional nuclear fusion

Confinement and its strings

Let's move from propulsion to particle interaction. In directional physics, a particle is defined by an internal confinement containing a set of vibrating strings connected to a directional core. In nuclear fusion, two confinements interact deeply, causing extreme compression, geometric deformation, and a redistribution of internal tensions. The resulting fundamental phenomenon is the migration of strings from one confinement to another, which allows for the formation of heavier particles and complex nuclear structures.

Directional compression

During fusion, the confinements of the two particles come closer until they come into directional contact. They compress under the effect of internal tension, their geometry deforms and their internal frequencies partially synchronize. This compression creates a directional contact zone where the internal strings can lose their initial anchorage.

Directional transfer of strings

When the inner walls of the two containments touch, the strings can stretch beyond their original confinement, detach from their initial directional core, re-anchor themselves in the neighboring containment, and synchronize with the strings of the other particle. This phenomenon is called directional string transfer (DDT). It is the directional equivalent of the multinucleonic transfer observed in classical nuclear physics, but at a deeper level: that of the internal structure of the particles.

Heavier particle formation

When strings migrate to another confinement, the internal tension of the receiving confinement increases, its directional frequency rises, its emergent mass increases, and its internal geometry becomes more complex. A heavier particle can thus emerge from fusion in three ways: by increasing the number of strings, by widening the confinement, or by stabilizing a composite

structure. This mechanism explains the formation of heavy nuclei, massive isotopes, and complex directional particles.

String migration can also cause a reorganization of the directional core: a displacement of the nucleus, internal polarization, a splitting of the core into subnuclei, directional multipolarity. This reorganization allows the confinement to stabilize the new received strings. In some cases, fusion creates a confinement with several subnuclei, several tension zones and several resonance axes; such a particle is directionally heavier and more complex.

Complete directional fusion

A complete directional fusion occurs when the two confinements fully synchronize, the strings redistribute between the two structures, a single or multipolar directional core is formed, and a unified confinement emerges. The result is a new, more massive directional particle with a high internal voltage, a stronger directional frequency, and a rearranged internal geometry.

Implications

This geometric and internal vision of fusion, complementary to classical nuclear physics, makes it possible to explain the formation of heavy nuclei, asymmetric fusion reactions, exotic particles observed in collision, unstable composite structures and mass anomalies in energetic reactions. It is naturally integrated into the study of confinements, directional nuclei and internal interactions. It also prepares the understanding of the reactor that follows: if fusion is a reorganization of strings, then a plasma dissociated down to the elementary particles can be recomposed in a directed manner.

The spherical reactor, a universal recycler

The principle: a domesticated sun

Mastery of matter requires an understanding of its fundamental structure. Any substance, whether organic, metallic, composite or even radioactive, can be returned to its primordial state if it is exposed to sufficient thermal and energy stress. The Spherical Reactor, Universal Rebreather, is the natural outcome of this logic: a structure capable of completely decomposing matter, neutralizing unstable isotopes and rebuilding pure materials, while producing energy.

Unlike torus-shaped reactors, which are engineering compromises, the sphere is the perfect cosmic shape. Stars, suns, blue giants, white dwarfs: all the fusion structures of the Universe are spherical. The pressure is uniform, the stability maximum and the internal dynamics naturally centered. The reactor is directly inspired by this geometry. It is not a machine, but an artificial star, a domesticated sun, a universal tool for transforming matter. Its principle can be summed up in one sentence: create a miniature sun to recycle the universe.

The transformation cycle

The process takes place in successive stages. The material is first preheated to 3500 °C before being injected into the core. At this temperature, the molecules break, the chemical structures

disappear, the materials vaporize and the first ions appear. The matter becomes a pre-plasma, an intermediate state where it no longer has any form, structure or identity.

It is then injected into the spherical core, a reflective sphere containing an extremely hot fusion plasma. This core acts like a miniature sun, where matter is exposed to such thermal and directional tension that it is dissociated to the atomic state. It reaches the state of integral plasma: atoms are separated, electrons are torn off, unstable isotopes are broken and radioactive particles are neutralized. This level of dissociation is beyond the reach of conventional industrial furnaces, lasers or tokamaks; only a spherical geometry provides sufficient uniform pressure. Integral plasma is the purest form of matter, a collection of elementary particles ready to be reassembled, and it is the primordial state of matter and the key to universal recycling.

This is followed by gradual directional cooling. It captures heat, converts energy into electricity, guides atomic recombination, and eliminates any residual radioactivity; each degree lost is a unit of energy recovered. The reactor thus produces energy as it cools, which is the opposite of human systems. At the end of the cycle, matter can be recomposed into pure materials, transformed into new alloys, converted into neutral materials, or stored in a stable form. The reactor does not eliminate waste: it transforms it. It does not bury radioactivity: it neutralizes it. It does not destroy matter: it resets it.

These steps form a directional cycle in three phases: decomposition, where matter is dissociated down to the integral plasma; neutralization, where unstable isotopes are broken and reset; recombination, where matter is rebuilt cleanly, without waste. This cycle is self-sustaining, self-stabilized, and self-energetic.

Internal geometry of the sphere

The sphere has three fundamental properties. The pressure is uniform, since each point on the surface exerts an equal force towards the center. Stability is maximum, with no weak zone, no angle, no geometric break. Finally, convergence is directional: all energy is naturally directed towards the core. In a torus, pressure moves, deforms, fragments; in a sphere, it is concentrated, and it is this concentration that makes it possible to create an artificial mini-sun.

The inside of the sphere is covered with an ultra-reflective, heat-resistant, directionally neutral wall capable of withstanding millions of degrees. It reflects light, heat, particles, and directional waves. It acts as an energetic mirror that prevents any loss and reflects tension back to the center, allowing the plasma to remain stable, dense, and confined.

At the center is the fusion plasma, a ball of pure energy held together by directional fields, thermal gradients, spherical pressure, and internal reflection. This core dissociates matter, neutralizes radioactive isotopes, produces colossal energy, and remains stable thanks to spherical geometry. The sphere is not a vessel: it is an artificial star, and even a cosmic amplifier, since its geometry amplifies directional voltage, light is reflected losslessly, and fusion is self-sustaining.

Around the core, directional fields stabilize the plasma, prevent leakage, maintain pressure, and guide the injected material. They are not conventional magnetic fields: they obey the law according to which all vibrations move towards its positive pole. The reactor uses this law to orient the plasma, control the voltage, maintain fusion and avoid instabilities.

The internal space is divided into three zones that correspond to the cycle. Zone A is the preheating chamber, at 3500 °C, where the material is vaporized and ionized. Zone B is the fusion core, where the matter is dissociated down to the elementary particles. Zone C is the recomposition chamber, where the plasma cools, the energy is recovered and the matter is rebuilt.

The torus therefore appears to be a conceptual error. Tokamaks and stellarators are human compromises, which exist because engineers do not know how to stabilize a plasma in a sphere, whereas nature does. In the Universe, no torus produces fusion and no star is toric: the torus is a technical solution, the sphere a cosmic solution. The reactor adopts the shape that the Universe has always used.

The directional law of the poles

The complete model is based on the law of the poles: every string has two poles. The positive pole is the direction of vibration, expansion, creation; the negative pole is the direction of return, contraction, stabilization. This law is the basis of all directional physics. In the reactor, the positive pole of the plasma directs energy towards the center, while the negative pole stabilizes the recomposition of matter. The sphere is the only geometric shape that perfectly respects this law. Recomposition obeys the corresponding rule: any reconstructed particle must align its positive and negative poles.

Neutralization of radioactive materials

Radioactivity is one of the most difficult forms of matter to deal with: unstable isotopes emit dangerous particles, decay unpredictably, and require thousands of years of confinement. Directional physics reads it differently: a radioactive material is an unstable rope, whose internal tension is unbalanced and whose directional poles are misaligned. Radioactivity is not a curse but a tensional instability. The reactor corrects it by breaking the atomic structure, resetting the particles, and rebuilding the matter in a neutral form.

When radioactive material is injected into the core, unstable nuclei are dissociated, excess neutrons released, protons rebalanced, and electrons torn off. No atomic structures survive, no radioactivity remains, and the material becomes an integral plasma identical to any other dissociated matter. During directional cooling, the energy released by decay is recovered, particles are stabilized, and neutral atoms are reconstructed. The realignment of the poles eliminates instabilities, imbalances, internal tensions, and future radioactive emissions: the final material is completely stable, even if it came from nuclear waste.

Radioactive waste can thus become neutral metals, composites, stable alloys or directional materials. The reactor does not store radioactivity, it converts it; it does not contain unstable

isotopes, it resets them; it does not manage waste, it purifies it. The very concept of nuclear waste disappears, and with it the danger. Spherical geometry ensures that all energy converges towards the center, that all particles are confined and that no radiation can escape: the reactor neutralizes 100% radioactivity, with no leaks, no emissions, no contamination. Nuclear power plants no longer have waste, unstable isotopes become resources, and the reactor is presented as the definitive solution to the global nuclear problem.

Energy production

The reactor is also an energy generator. In directional physics, all matter contains a finite but real internal voltage, defined by:

$$E = Mc^2$$

When matter is dissociated, this voltage is released and then converted, and even ordinary materials, metals, plastics or composites, contain recoverable internal energy. Radioactive materials, on the other hand, contain an unstable internal voltage, defined by:

$$E = Mc^\infty$$

This energy, normally dangerous, uncontrollable and dispersed in the environment, is here captured, converted, stabilized and neutralized: each unstable isotope becomes a source of directional energy before being rebuilt in stable form. The internal tension of a rope therefore has two regimes: the confined regime, $E = M \cdot c^2$, and the released regime, $E = M \cdot c^\infty$. In the reactor, the preheated matter releases its finite energy, the radioactivity releases its infinite energy and the integral plasma releases its total directional energy; the reactor converts these three regimes into exploitable energy.

The integral plasma also releases its thermal energy, directional energy, dissociation energy, and recombination energy. It is a state where the particles are free, the internal voltages are maximum and the energy conversion is optimal, and the core produces energy comparable to controlled fusion. Gradual cooling, however, is the decisive step: with every degree lost, heat is captured, directional voltage converted, energy stabilized, and matter rebuilt, with no loss, no leakage, no waste, and no radiation.

The recovered energy is converted into electricity, process heat, directional energy and, in the case of the SMD spacecraft, propulsion. This conversion is based on the law that all vibrations are directed to its positive pole, which helps to guide energy, stabilize flows, avoid losses, and optimize conversion. The reactor does not need turbines, pistons, or mechanical generators: it converts directional voltage directly into usable energy.

Each stage of the cycle is an energy source: preheating, dissociation, neutralization, cooling and recombination. The reactor is at the same time a power plant, a universal recycler, a nuclear neutralizer and a directional generator, operating in a closed cycle, without fuel, without waste,

without loss. The energy produced is clean, without emissions or radiation, stable, without peaks or instability, continuous, without interruption, and infinite, since as long as there is material to recycle, there is energy. The spherical reactor is thus presented as the first technology capable of producing cosmic, directional, neutral and unlimited energy.

Technical specifications

The reactor is designed according to a perfectly isotropic geometry. Its dimensions vary depending on the application, but the standard models meet the following parameters: an external diameter of 12 to 30 meters, a diameter of the fusion core of 2 to 6 meters, a reflective wall 25 to 60 centimeters thick and a useful recycling volume of 80 to 95% of the internal volume.

The structure uses advanced directional materials: a high-temperature reflective alloy, which withstands several million degrees and reflects light and particles towards the center; a neutral directional composite, which does not react to directional fields and does not deform under tension; an inner layer of total reflection, which functions as an energetic mirror and prevents any thermal or photon loss. Preheating to 3500 °C is provided by thermal injectors, directional lasers and vaporization chambers, which transform the material into pre-plasma before injection.

The directional fusion core, an artificial mini-sun maintained by directional fields, uniform spherical pressure and total energy reflection, operates at an internal temperature of 10 to 50 million degrees, with a uniform and centered directional pressure, a plasma with self-maintained stability and 100% atomic dissociation. Confinement obeys the law of the poles and is superior to conventional magnetic fields: it stabilizes the plasma, directs the voltage, neutralizes instabilities and excludes any energy leakage.

Cooling is carried out by controlled gradient, with direct energy conversion, an efficiency of more than 98% and no heat loss. The recomposition module realigns the directional poles, rebuilds neutral atoms, eliminates instabilities and produces neutral metals, stable composites, directional materials and tailor-made alloys. The reactor can process nuclear waste, unstable isotopes, irradiated materials and spent fuel, with full neutralization, residual radiation, instability, emissions and contamination. In terms of energy, its efficiency is more than 100% from an industrial point of view, as the recycled material itself becomes an energy resource. Finally, the spherical geometry ensures no leakage, no radiation and no instability, as well as total containment: the reactor is inherently safe, even in the event of an external failure.

Summary

The spherical reactor is not a human invention but a cosmic replica: it functions like a domesticated star and applies the fundamental laws of directional voltage. It reproduces the internal conditions of a celestial body while offering total control over matter and energy, and opens the way to energy, industrial, environmental and space applications on an unprecedented scale.

The four parts of this chapter respond to each other. The rotating rocket shows that rotation increases dynamic mass and, through it, energy, according to $E_d = m_0 c^2 + k \cdot \omega^2 \cdot r \cdot c^2$. Black holes

and SMD extend this principle to strings: the rotation of a saturated region increases the effective mass and directional density, and produces a geometric current that moves space and matter, until gravity becomes passive propulsion. Directional fusion describes, at the scale of the nucleus, the migration of strings from one confinement to another that generates heavy particles. Finally, the spherical reactor applies the law of the poles and the geometry of the stars to dissociate, neutralize and recompose matter by producing energy. In all four cases, matter is not an inert object placed in a passive space: it is an internal dynamic of strings, tensions, and geometry, which can be understood, oriented, and put at the service of propulsion and energy.

Chapter 7 — Matter, Antimatter and Particles

Directional physics is based on three principles: mass is made up of confined strings, light is a liberated string, and energy is directional tension. This chapter draws the consequences for the structure of particles. It first shows why a universe needs both matter and antimatter, then it describes the confinement that gives mass, the God Particle that inhabits it, and the directional core that regulates its stability. It then presents the inverted geometry of the antimatter universe, the scenario of annihilation and the directional Big Bang, the structure of the Omniverse, and finally the dynamics of masses and how a particle can be influenced and read.

1. Matter and antimatter: a necessity

1.1 The directional law of the poles

In directional physics, matter and antimatter are not geometric opposites: they are inverted tensional configurations of directional strings. Each string has two poles. The positive pole is the one towards which the vibration is directed; the negative pole stabilizes the string and absorbs the tension. These poles are not electric charges but fundamental directional orientations, and their coexistence is essential for the creation of a coherent universe.

A fundamental law is stated as follows: every string vibrates towards its positive pole. This pole determines the direction of propagation, the frequency, the tension, the ability of the string to be released in the form of a photon and its ability to confine itself in the form of mass. The negative pole ensures return, contraction, stabilization and structural cohesion. The positive pole creates, the negative pole stabilizes, and both are necessary to create a universe.

This necessity can be read in its two negations. Without a positive pole, there would be no vibration, no light, no energy. Without a negative pole, there would be no mass, no structure, no stability.

1.2 Material, stable directional structure

Matter is made up of confined strings, with stable internal tension, coherent directional geometry, and a mass that persists over time. It is therefore a stable directional structure, which retains its internal tension indefinitely. It is this persistence that allows the formation of particles, atomic cohesion, star formation, and the structure of galaxies.

1.3 Antimatter, an unstable directional structure

Antimatter is made up of inverted strings, with an unstable internal tension, an inverted directional geometry, and a non-persistent mass. It is an unstable directional structure: unable to maintain its internal tension indefinitely, it leads to collapse, annihilation, extreme phenomena, and zones of tensional break.

Matter is necessary for coherence, structure, stability, and persistence. Antimatter is necessary for inversion, rupture, extreme phenomena, and cosmic dynamism. Their interaction produces annihilation, extreme energies, and directional rebalancing. They are therefore not opposites but complementary necessities: matter brings stability, antimatter brings inversion, light brings infinity, and together they make the universe possible.

1.4 The mass of the photon and the two energy regimes

Einstein assumed that the photon has no mass at rest. This assumption is compatible with classical physics, but it is incorrect in directional physics. A photon is a liberated string; every string has a directional tension, and this voltage corresponds to a directional mass. This mass is infinitesimal but not zero, and it cannot be measured at rest since a photon cannot be immobilized. A photon thus has a directional mass equal to that of a liberated confined string.

This correction sheds light on the two energy regimes. The confined regime is that of the classical equation:

$$E = Mc^2$$

It is valid when all the strings remain confined, the internal tension is finite, and the particle is stable. In this regime, c is the maximum directional current and $c \times c$ the finite maximum directional tension: this is the regime of stable matter.

When a string is released, it becomes a photon and enters the released regime. The frequency tends to infinity, the voltage tends to infinity, the propagation is perpetual, and the directional mass becomes infinitely persistent over time. Photon energy is written:

$$E_{\text{photon}} = m_{\text{photon}} c \cdot \infty$$

which condenses into $E = M \cdot c \cdot \infty$, the expression of an infinitesimal mass multiplied by an infinite directional intensity.

The total energy is the sum of two contributions: E_1 , the internal tension of the confined strings, and E_2 , the tension of the released string.

$$E = E_1 + E_2$$

When the release occurs, E_2 becomes infinite and we obtain the complete directional version of the mass-energy relationship:

$$E = E_1 + E_2 = Mc^\infty$$

2. Confinement, the origin of mass

2.1 The immobilized photon

Confinement is the fundamental structure that gives rise to mass. It fixes matter, stabilizes its internal energy and imposes a directional geometry that determines its behavior in space-time. Mass is not a secondary attribute: it is the direct result of confinement.

In its natural state, a photon moves at a speed of C . It has no proper time, mass, or density, and it travels through the universe without ever stopping. Confinement acts as a geometric nucleus capable of capturing photons: when a photon enters a containment zone, it loses its directional freedom, comes to rest in the internal structure, and ceases to be a free wave. Its momentum becomes internal tension, its dynamics become density, and mass is born from the stabilized light. Mass appears when the photon stops moving, and confinement is what stops it.

Matter is therefore not an assembly of independent objects but a set of confined photons, immobilized in an internal geometry that gives them inertia, density, time of their own and material existence. The more intense the confinement, the denser the matter; the denser it is, the more the proper time slows down; the more the proper time slows down, the more important mass becomes in geometry. Confinement is not an external force: it is a directional structure, an internal core that stabilizes energy and imposes a form on it. Matter exists because energy is retained, the photon is immobilized, the internal geometry is closed, and the directional tension is constant.

2.2 The Proper Mass of the Confinement and the 0 Spin

Confinement is not an empty space. It has a mass of its own, an internal density that exists even when no strings are present, and this mass is intrinsic to its geometry rather than produced by the strings. When a string enters it, two masses combine: E_1 , the mass-energy of the confinement, and E_2 , the mass-energy of the string. The total mass is then:

$$E = E_1 + E_2 = Mc^2$$

The mass of a particle is thus the sum of the mass of the confinement and that of the strings it immobilizes. Confinement fixes the string, immobilizes its internal photon, stabilizes its energy, transforms its motion into density and increases the total mass. The more intense it is, the more its proper mass grows; the more it grows, the higher the internal tension; the higher the tension, the more geometry slows down proper time.

A confinement containing no strings has no internal directional friction: no vibration, no directional cycle, no fraction of the surface traveled, no dynamic tension. It is perfectly static, and has a spin of 0. This spin 0 is not a lack: it is the ground state, the pure geometry on which the

strings will then create fractional spins, spins $1/2$, spins 1, 2, 3, depending on the portion of the internal surface they travel. The spin only appears when the strings travel a portion of this surface.

3. The God Particle

3.1 Ubiquitous geometry

The God Particle represents the ultimate state of confinement: an absolute, omnipresent confinement, capable of stabilizing all energy and giving it a material form. It is not an object but a perfect geometry where the photon stops moving, where energy becomes density, density mass, and mass structure. It is not limited to the observable universe: it exists everywhere, in every direction, in every region, even beyond what light can reach. It constitutes space itself, and its internal tension constitutes time. It is not in the universe: it is what allows the universe to exist.

Its vibration is peculiar, unique in all directional physics. It is not a classical wave but an internal tension that propagates in all directions of space, and it has the property of adding mass to a normal particle. When a particle enters its zone of influence, its internal vibration combines with that of confinement, part of its energy freezes, this immobilized energy becomes density, and density becomes mass. Mass therefore includes the direct contribution of the vibration of the God Particle, and not only that of the strings.

3.2 Bipolar Field and String Orientation

The God Particle has a bipolar field, negative on the inside and positive on the outside. The internal negative field attracts photons, strings, and directional energy; it captures and immobilizes them, creating the internal density, and is the capture zone. The external positive field stabilizes the mass formed, the internal geometry, and the directional tension, and is the stabilization zone. Together, these two fields allow matter to exist.

When the strings enter the God Particle, they orient their poles according to the geometry of the field. The negative pole of the string is placed in the center, attracted by the negative internal field, while the positive pole rubs against the negative part of the confinement. This directional friction produces the internal tension that generates mass: it increases the density, slows down the proper time and stabilizes the particle. The mass appears when the positive pole rubs on the negative zone of the confinement.

In antimatter, the poles are reversed: the positive pole is placed in the center and the negative pole remains outside. This inversion creates an opposite directional geometry, an inverted internal tension, and an incompatibility with normal matter. Antimatter is defined by the inversion of the poles in confinement, which explains its instability, the extreme energy released during annihilation, and its opposite directional behavior.

3.3 Potential dimensions

In directional physics, a dimension is not an imposed mathematical axis but a real direction, a physical orientation in which a string can point and vibrate: a dimension is a direction of vibration of a string. Each string has only one internal direction, and its vibration is strictly unidirectional.

The photon is proof of this: it moves in a single direction, does not spontaneously change axis, vibrates in a perfectly coherent way and follows its positive pole on a single line. A free string therefore vibrates on a single dimension, and the photon reveals what a dimension is before confinement: a pure direction, a unidirectional vibration, an internal geometry without mass.

If a dimension is a direction, all possible directions of space are potential dimensions. The universe does not have three fixed dimensions: it has as many as possible directions, i.e. an infinite set. When a string enters a confinement, its negative pole is placed in the center, its positive pole rubs against the negative zone, its vibration stabilizes, and its internal direction becomes fixed. The confinement thus freezes the internal dimension of the string, which is locked in a single dimension. The dimensions are not imposed on the universe: they emerge from the internal directions of the strings.

4. The central core of a lockdown

4.1 Internal Structure

A particle is not an elementary point but an internal structure: a directional confinement containing a set of vibrating strings, at the center of which is the directional core. The confinement consists of an inner wall forming its geometric boundary, a central core, and a set of N directional strings connected to this core. The strings vibrate between the inner wall and the core, and this oscillation creates the directional frequency, internal energy, and emergent mass of the particle.

The directional core is the point of maximum tension of the confinement. It is the internal geometric center, the anchor point of the strings, the zone of highest directional density, and the origin of the particle's vibrational coherence. In a steady state, it is perfectly centered, and its position determines stability, directional mass, and internal frequency.

4.2 Displacement, polarity and split

During a nuclear reaction, fusion or fission, the internal geometry of the confinement undergoes extreme compression, directional deformation and a redistribution of internal tensions. The nucleus can then move towards the inner wall, as a result of a change in directional density that creates a geometric imbalance. One area of the confinement becomes denser, the other less dense, and thus a directional polarity is born: a "positive" of high voltage and a "negative" of low voltage. This polarity is not electrical, it is a geometric polarity related to the internal directional voltage.

When the reaction is particularly intense, the nucleus is no longer content to move: it can split into several subnuclei. This split occurs when the internal directional tension exceeds the ability of the nucleus to remain unified, when the internal strings pull it in several simultaneous directions and when the geometry compresses asymmetrically. The subnuclei stick to different areas of the wall, each has its own directional density and each generates its polarity, hence a directional multipolarity that is much more complex than a simple dipole. It allows multiple directional links, complex nuclear structures, multi-center fusions and the stabilization of heavy

or atypical nuclei. Confinement thus appears as a dynamic structure capable of reorganizing its internal geometry under extreme tension.

4.3 Directional Attraction and Nuclear Implications

Two particles with off-center or split nuclei, which have a compatible internal polarity and voltage, can attract each other. This strong directional attraction, distinct from the classical strong nuclear force, allows fusion, the formation of complex nuclei, directional cohesion between particles, and the stabilization of unusual atomic structures.

The model draws several conclusions from this. In fusion, off-center or multipolar directional nuclei attract each other, which facilitates it. In fission, a nucleus that is too off-center or split can cause a rupture of confinement. Some isotopes are unstable because their directional nuclei is not centered or has excessive multipolarity. Finally, multiple polarities allow for the complex bonds that form heavy nuclei. The central nucleus thus determines the stability of the particle, its emergent mass, its internal polarity and its nuclear binding capacity.

4.4 Fusion as String Migration

Nuclear fusion is a profound geometric reorganization of confinements, before being an energetic reaction: it allows two particles to synchronize their centers, glue their edges, and swap strings to form heavier structures. When it begins, extreme energy excites the confinements; the centers, normally located in the middle, move toward their inner edges as a result of increased voltage, wobble excitation, partial confidation opening, and directional synchronization. When the centers reach the edges, they can align perfectly, and fusion begins when they stick to the edges of the containment.

The two confinements can then be linked. This connection is a geometric, not volumetric, fusion: the confinements remain distinct, but their edges become a shared zone where vibrations synchronize, poles align, tensions stabilize, and a common geometry is created. With the edges glued, the ropes can pass from one confinement to the other, thanks to a temporary directional opening, synchronization of internal fields, alignment of the poles, and common directional tension. A rope leaves its original confinement, passes through the binding area, and anchors in the neighboring confinement.

The receiving particle then increases its internal tension, density and mass, and its geometry changes. It contains the mass of the confinement, that of the original strings and that of the received strings: it is heavier. This mechanism explains the formation of heavy nuclei, the creation of massive unstable particles and the appearance of complex directional structures. Directional fusion is an internal migration of strings that creates mass.

5. Unstable particles and non-nuclear bonds

Some particles do not have a perfectly stable central nucleus. Their directional nucleus is said to be unstable: it is not centered in the confinement, its internal voltage is unbalanced, its directional frequency varies, and its internal geometry is constantly reorganized. It moves in response to internal voltage variations, external interactions, directional fluctuations, and resonances

between strings. This displacement creates a directional dipole, analogous to an electrical dipole but based on internal geometry rather than charge. Under certain conditions, the nucleus splits into subnuclei attached to various areas of the inner wall, creating directional multipolarity.

These particles exhibit a fluctuating polarity, made up of zones of varying tension, multiple internal gradients, and changing resonance axes, which changes over time. It allows spontaneous directional interactions: such particles can bind to others without a nuclear reaction, when their polarities are compatible, their internal tensions synchronize, and the frequencies of their strings are in tune. These non-nuclear bonds allow for the formation of unstable composite particles, transient interactions, complex directional structures, and directional vacuum fluctuations.

The model thus accounts for exotic particles, transient bound states, weak interactions, and anomalies observed in high-energy collisions. Unstable directional particles form a fundamental class of directional physics, which is integrated into the study of confinements, chords, and directional nuclei.

6. $-\Phi$: the universe of antimatter

6.1 A complete and autonomous universe

The universe of antimatter is neither an anomaly nor an inverted copy of our own: it is a complete, autonomous structure, governed by an inverse geometry. Where matter is organized according to the golden ratio Φ , antimatter follows its antipode, $-\Phi$. This inverted ratio is not a simple negative sign but a fundamental dynamic, a cosmic direction that shapes all the structures of this universe.

In the universe of matter, Φ guides expansion, growth, the organization of forms, and the spiral of galaxies: spirals expand, shapes grow, structures unfold, and tensions are resolved by expansion. In the universe of antimatter, $-\Phi$ guides contraction, inversion, and torsion: spirals fold, shapes contract, structures reverse, and tensions are resolved by compression. This universe is neither hostile nor destructive: it is a mirror, symmetrical world, whose opposite logic is just as coherent. Each law has its reflection, each force its opposite, each structure its inversion.

6.2 The Reverse Spiral

The most visible signature of the universe $-\Phi$ is the inverted spiral, the exact opposite of the golden spiral that structures galaxies of matter. It is not an aesthetic symbol but a fundamental law that shapes the galaxies, nebulae, tension fields, internal trajectories and fractal structures of this universe. In matter, $\Phi = 1.618\dots$; in antimatter, $-\Phi = -1.618\dots$. This change of sign completely transforms cosmic dynamics: matter expands and antimatter folds; matter is organized in open spirals, antimatter in closed spirals; matter creates expansive galactic arms, antimatter counteractive arms.

A galaxy of matter rotates in a direction determined by the mass distribution, the curvature of space, the gravitational dynamics, and the geometry of Φ . An antimatter galaxy rotates in the opposite direction, guided by the antimass distribution, the inverted curvature, the mirror

gravitational dynamics, and the geometry of $-\Phi$. This inverted rotation is the first clue to identifying an antimatter galaxy; it follows a regular, stable, and repetitive structure that cannot be mistaken for an anomaly. Inverse tensions that resolve there by contraction produce areas of inverted density, negative torsion fields, oppositely curved trajectories, and contractive vortices instead of expansive vortexes. Without the inverted spiral, the $-\Phi$ universe would be unstable: structures would collapse and its internal geometry would be incoherent. It is its geometric pillar, as the golden spiral is for matter.

6.3 Inverted Physical Laws

The laws of the universe $-\Phi$ do not contradict those of matter: they are the antipodes, the mirror versions. In matter, forces tend to extend, disperse, dilate and separate; in the universe $-\Phi$, they tend to contract, concentrate, fold and bring together. Structures do not spread, they tighten; fields close; trajectories converge.

Gravity is a mirror gravity, not a repulsive force or an anti-gravity. In matter, gravity bends space inward, masses attract, and structures collapse under their own weight. In antimatter, antibodies also attract, but the curvature follows an inverted twist, a negative geometry. The result is inverted orbits, counteractive vortices, areas of mirror density, and folded galactic structures.

Negative torsion fields run through this universe: they reverse the direction of forces, modify the trajectory of particles, compress fractal structures, and stabilize inverted spirals. Without them, contractive structures would collapse. The mirror particles that live in them are not simple antiparticles: they possess inverted helicity, contractive internal dynamics, a negative curved trajectory, and an interaction stabilized by torsion fields. They follow a logic of their own, coherent and stable, but totally opposite to that of matter.

Finally, a tension is resolved in matter by expansion, dispersion and release of energy, and in antimatter by contraction, compression and absorption of energy. This difference explains why $-\Phi$ structures are more compact, denser and more folded. The whole forms a complete, autonomous and coherent physics.

6.4 Light, bridge between Φ and $-\Phi$

Light is the only force that passes through the universes without losing its identity. It is neither a particle nor a wave: it is a directional vibration, a fundamental movement that crosses space without mass and without inertia. It does not depend on Φ or $-\Phi$, nor on the geometry of spirals, nor on contractive or expansive laws, for its nature is not linked to matter but to the structure of the vacuum that separates the layers of existence. Matter vibrates according to Φ , antimatter according to $-\Phi$, but light vibrates according to a neutral law, independent of the two. It is the only element that does not have an antipode, and it does not change its nature: it only changes its direction.

In the antimatter universe, light plays exactly the same role as in matter, with the same speed, frequency and dynamics: it structures fields, stabilizes voltages and carries information. It passes through folded structures without changing and is neither inverted nor contractive. It carries

energy, information, structure and coherence, and can cross layers, tensions, boundaries and areas of inverted density. Its vibration is a universal language understood by matter as well as antimatter. It is the cosmic constant that allows the two universes to exist without collapsing, the bridge between Φ and $-\Phi$. Two universes, two geometries, two dynamics, a single light: the universe of antimatter is not the inverse of ours, it is its reflection, its balance, its antipode, its other half. Creation exists in a direct and an inverted version, unfolding in Φ and folding in $-\Phi$.

7. Dimensional Annihilation, Collapse, and Explosion

7.1 The Destruction of Bipolar Geometry

Dimensions are not guaranteed: they can contract, disappear, or collapse when the internal geometry loses its stability. A dimensional collapse is the total loss of internal directions. A string vibrates on a single dimension, stabilized by confinement, internal tension, and the geometry of the God Particle; but when the tension becomes too high or the geometry contracts, the string loses its direction and the dimension collapses. If the confinement itself contracts, loses its tension, destabilizes, or collapses, the internal dimensions disappear one by one, resulting in a loss of mass, density, proper time, and geometry.

The meeting of matter and antimatter produces this collapse. Matter has a negative pole in the center and a positive pole outside; antimatter, a positive pole in the center and a negative pole outside. Their internal geometries being opposite, their internal fields neutralize, deregulate and lose their directional coherence: the encounter destroys the bipolar structure of confinement. The internal negative field no longer captures, the external positive field no longer stabilizes, the fundamental vibration is out of order and the directional tension collapses. The God Particle ceases to confine and the strings escape, lose their direction, lose their dimension, become free.

The mass then disappears, the density collapses, the proper time cancels out, and the internal geometry implodes. The particle loses all its internal dimensions and becomes a directional point with no volume, no tension, no structure. The dimensional collapse is an implosion.

7.2 The ϕ Symbol and the Directional Big Bang

To represent annihilation, the model uses a geometric symbol: an inverted ϕ and an inverted ϕ , glued together by their bases. It encodes the opposition of the poles, the neutralization of the fields, the destruction of the internal geometry, and the dimensional collapse. When the two ϕ stick together, the internal directions neutralize each other, the dimensions disappear, and the geometry implodes; when the energy is released, the two ϕ separate, the directions reappear, and space reopens. The symbol thus represents the implosion followed by the explosion.

The mass was the energy of the confined strings, that of the internal vibration and that of the God Particle. When the confinement disappears, this energy is released in its pure form, $E = M \cdot c^2$. It is not a mechanical explosion but a directional explosion, a reopening of dimensions, an expansion of space. The Big Bang is not an initial explosion: it is an implosion (dimensional collapse), followed by an explosion (release of $E = M \cdot c^2$), caused by the meeting of matter / antimatter and symbolized by $\phi + \text{inverted } \phi$ glued by their base. It can be summarized as follows: $\phi + \phi \text{ reversed} \rightarrow \text{collapse}$

→ explosion → expansion. It is the reconstruction of space, time and dimensions after their total disappearance.

7.3 The Dimensional Blast

The implosion is not the end: it is the beginning of the dimensional explosion, the reconstruction of space after its disappearance. The energy of the mass, by being released, does not scatter at random: it reactivates the fundamental vibration of the God Particle, which recreates directions, reopens axes, reforms dimensions and restores coherence to space. Dimensions reappear before matter; they impose their geometry, dictate the shape of space and prevent matter from collapsing again.

This is why the universe does not end up in a black hole. Dimensions reopen faster than matter can shrink again: space expands, directions multiply, internal tension distributes, and density drops instantly. Matter is dispersed in a space that grows faster than it can collapse, and dimensional expansion prevents global gravitational collapse.

There is an exception at the center of the explosion. Where the collapse has been maximum, the directional tension is so extreme that the dimensions reopen more slowly, the density remains high, the geometry remains contracted, and the God Particle struggles to stabilize the strings. This point becomes a directional singularity, equivalent to a primordial black hole, a remnant of the maximum collapse, the only place where matter can end up in a black hole. In this model, the Big Bang is an explosion of dimensions, not matter: matter is propelled by the reopening of internal directions, and space expands not because matter pushes, but because dimensions take over. The universe expands because dimensions reactivate, and then matter follows, disperses, stabilizes, and forms structures.

7.4 The Rotation of the Early Universe

Before the collapse, matter and antimatter move closer together in a wobbly position. This wobble creates directional tension, synchronizes the inverted poles, determines the geometry of the impact, and prepares the initial angular momentum. The two particles never meet perfectly aligned: they oscillate, slide, and rotate slightly around each other. The pre-impact wobble creates the angular momentum of the universe.

Moreover, there is always an angle of impact, even a small one, that breaks the symmetry, imposes a twist, creates angular momentum, and determines the direction of rotation of the new universe. An impact slightly shifted to the left gives a rotation in one direction, and an impact slightly shifted to the right gives a rotation in the other direction. The universe is born with a direction of rotation determined by the angle of impact matter/antimatter, and this initial angular momentum is amplified by the dimensional explosion, which stretches the torsion in all directions.

8. The Omniverse

The Omniverse is the structure that encompasses all universes. It is not a classical space but a higher directional space-time, a meta-confinement devoid of center, edge, and limit, where there are regions each with their own internal geometry. It is made up of infinite potential directions,

variable internal tensions, zones of dimensional coherence, and isolated regions where dimensions stabilize. Each stable region becomes a universe: a universe is a zone of dimensional coherence in the Omniverse.

Every universe has a fundamental polarity. In a universe of matter, the negative pole is in the center and the positive pole outside; in an antimatter universe, the positive pole is in the center and the negative pole outside. This polarity determines the internal geometry, stability, the direction of proper time, the way the strings vibrate, and the shape of the particles. There is no such thing as a mixed universe: the polarity is total and homogeneous in each region.

The universes are separated because matter and antimatter have opposite internal geometries. If two universes of different polarities were to come closer, their internal fields would neutralize each other, their dimensions would destabilize, their confinements would collapse, and the God Particle would lose its ability to contain, causing a total dimensional collapse followed by a directional explosion. The Omniverse therefore naturally separates the universes of matter and antimatter. It is not static: the universes can drift, move, expand, contract, move closer or further apart, but they never touch each other if they are of opposite polarities.

Each universe has its own dimensions, its own time, its own matter or antimatter, and its own God Particle. The Omniverse is thus a fractal structure: a space containing spaces, a time containing times, a geometry containing geometries. It is a fractal directional superstructure, a space-time where the universes of matter and antimatter coexist without ever meeting.

9. Mass Dynamics

9.1 The Principle

Mass dynamics relate motion, effective mass, and the geometry of spacetime. An object does not have a single, fixed mass: its mass increases with speed, and this increase changes the curvature of spacetime around it. The faster an object moves, the heavier it becomes in directional geometry and the more it distorts the structure of the universe.

When an object is stationary, its mass reflects only its internal tension and directional density. As soon as it starts moving, the displacement puts additional pressure on the geometry of spacetime, which raises its effective mass. This phenomenon arises from the increasing disruption of the directional field: the internal strings must pass through an increasingly contracted geometry, which requires more energy. Motion becomes a force that amplifies internal tension, tightens directions, and strengthens the geometric density around the object. Every acceleration is a transformation, every speed is a tension, and every movement is an interaction between matter, energy, and spacetime.

9.2 The bolas, on a human scale

The bolas, two balls connected by a rope, is the most intuitive example of this principle. When it is rotated, you feel in the hand that the faster the masses turn, the heavier they become. This sensation is not an illusion: the tension in the rope increases, the centrifugal force intensifies and

the object seems to gain weight. It is not the material mass that changes, but the dynamic mass, the one that depends on movement and geometry, resulting from the increase in the directional tension generated by the movement.

When the bolas are thrown, the higher its muzzle velocity, the greater its distance travels before losing its cadence: its increased effective mass translates into greater directional energy, which amplifies its range. Experience shows that velocity increases effective mass, effective mass increases directional tension, and that this tension changes the object's behavior in spacetime. Motion is never neutral.

9.3 SBDs at the Technology Scale

Dense Matter Spheres (GDS) are the technological version of the bolas. They are metal spheres, made of metals capable of withstanding very high directional tensions, that are placed in an accelerator ring to rotate them at extreme speeds. Unlike natural objects whose density comes from their internal composition, an SMD derives its directional density from its controlled motion. Its internal structure is stable and its material mass does not change, but its effective mass explodes under the effect of rotation.

The faster the SMD rotates, the more its dynamic mass increases, the more the geometry contracts around it, the tighter the internal directions, and the more intense the directional curvature it generates. A slow SMD produces a weak distortion; a fast SMD becomes a distortion nucleus, capable of creating a measurable geometric gradient. This is essential for directional propulsion: by controlling the speed of rotation, one controls the amount of curvature produced, and by modulating it one can manipulate the geometry, alter the local temporality, or produce directional forces. SMDs are not exotic objects but geometric tools, one of the technological foundations of directional physics and the basis of any architecture aimed at controlling the density, tension, and geometry of the universe.

9.4 Black holes, on a cosmic scale

Black holes, which can be described as black spheres, represent the dynamics of masses pushed to its maximum. A black hole is not just a massive object: it is a region where the effective mass reaches such an extreme value that geometry collapses in on itself. The directional density is maximum, the contraction of space-time is total, time slows down to the point of being immobile, and matter loses its coherence. A black hole is a cosmic SMD, a sphere whose effective mass is infinitely amplified by geometric contraction: the absolute limit of mass dynamics, the point where geometry triumphs over matter.

9.5 A universal law

The bolas, the SMDs and the black holes illustrate the same directional law: speed increases mass, mass increases curvature, curvature modifies time. The bolas is the human, intuitive and experimental version; the SMDs, the technological and controlled version; the black holes, the cosmic version. Mass dynamics is the key to directional physics, because it connects motion,

geometry and temporality in a single coherent structure. The universe is not static but alive, sculpted by speed, tension and density: speed sculpts geometry.

10. Influencing a Particle

10.1 Directional Transformation

Influencing a particle is never an isolated phenomenon: it is a directional event that transforms its internal structure. Each particle has its own vibration, spin, directional pressure, and geometric orientation that define its state and evolve with interactions. Any interaction, whether it is repulsion, confinement, energy variation, or photon trapping, changes the very nature of the particle.

When two particles repel each other, the observed force is only the external manifestation of a deeper phenomenon. Repulsion creates a directional tension, a compression of the internal fields, which modifies the vibration of the confined strings and alters spin, pressure and orientation. It is not a simple mechanical interaction but an energetic signal, an internal reorganization.

Trapping a photon is like imposing geometry on it. A free photon is a pure directional chord, with no spin, no confinement and no imposed orientation. Once trapped, the free string becomes a confined string and the particle ceases to be a photon in the directional sense: confinement imposes an orientation, modifies the vibration and creates a new directional state. Photon trapping is a major directional event, which transforms a light particle into a geometrically constrained particle.

10.2 The Directional Event

A directional event is the internal transformation of a particle caused by external variation. Classical physics describes interaction as a force or transfer of energy; directional theory sees it as a change in the vibrational geometry of the particle, which is not a side effect but the event itself. It occurs when the particle undergoes a variation in its internal vibration, directional pressure, spin, or geometric orientation. These variations are related to the structure of the string, confined or free, that makes up the particle. The event is therefore a measurable internal transformation, interpretable in an architecture like the VSMD.

Increasing the intensity of a laser on an entangled particle changes its directional pressure and creates an internal event, detectable if the laser pulses are synchronized at attosecond. This extreme synchronization makes it possible to distinguish a real variation from a measurement noise or a thermal fluctuation.

10.3 Entanglement and Resonance

In an entangled system, two particles share a correlated vibrational structure. Influencing one of them, through repulsion, energy variation, or laser pulse, creates a directional event in its confined string, and the bound particle can reflect this variation in its own state. This is not a classic information transmission but a directional resonance. Similarly, when two entangled particles are brought closer to another entangled pair, their directional fields resonate and can

influence the internal vibration of the four particles, creating a series of directional events. This proximity is not a simple spatial proximity but a geometric interaction between two coherent vibrational structures.

10.4 Directional Reading

Directional reading is the process by which an internal event becomes detectable and interpretable. In classical physics, a measurement is a value: frequency, energy, spin, polarization. In directional cosmology, it is a vibrational geometry: reading a particle consists of analyzing the shape of its vibration, the tension of its confined string, the internal directional pressure, and the geometric orientation imposed by the environment. It is not a snapshot but a dynamic interpretation of the internal transformation.

Attosecond synchronization establishes an absolute time reference, distinguishes a real variation from a measurement noise, isolates thermal fluctuations and allows the detection of events accurately. Without it, the reading would be drowned in quantum noise; with it, each variation becomes an interpretable signal. An event is detected by a change in spin, a tension in the confined string, a variation in directional pressure or an alteration in orientation. In an entangled system, the reading makes it possible to grasp the variation in the first particle, the resonance in the second and the coherence between the two; between close systems, it makes it possible to observe the geometric influence between them, the propagation of the variation and the overall vibrational coherence.

10.5 Reference Particles and Timeline Analysis

An entangled particle measured in isolation has an individual random state, which makes communication impossible. Directional theory therefore introduces an entangled reference pair, maintained in a steady state and monitored by attosecond-synchronized laser pulses. It serves as the basic directional geometry and distinguishes between natural variations, thermal fluctuations, and actual directional events: this is the "directional zero," the state of comparison that is essential for any coherent reading.

A second entangled pair serves as a directional channel. By influencing one of its particles, an event is generated in its confined string; it is not a transmitted message but a geometric variation, readable only when compared to the reference pair. The reading involves a succession of measurements: each laser pulse is a point in a directional timeline, where breaks, recurring patterns, vibratory sequences and directional patterns are detected. These patterns are not bits but temporal structures of variation, impossible to obtain in an isolated reading, and the timeline becomes a language space.

The signal never appears in the influenced particle alone: it arises from the difference between the timeline of the reference pair and that of the influenced pair. This comparison reveals the intensity of the event, its duration, its internal geometry and its vibrational coherence, and this difference constitutes the directional information. No waves are sent, no frequency is propagated, no classical transmission takes place: communication is based solely on the reading of internal

variations in a coherent entangled structure. The VSMD architecture is based entirely on this logic. A signal is not sent but detected, read, and then interpreted in the vibrational geometry of the entangled particles. Directional communication is not a technology: it is a natural consequence of the vibrational structure of the universe, where the internal geometry of the particles becomes the language and directionality replaces propagation.

Chapter 8 — Black Holes, Dark Spheres and Dark Matter

Introduction: Darkness as Direction

Language is the primary instrument of scientific thought. Before the equation, before the telescope, before the numerical simulation, there is the word, and the ill-chosen word digs a cognitive rut in which entire generations of minds slide without noticing. One of the most real and structured objects in astrophysics thus bears a name that suggests the exact opposite of what it is: the black hole. This chapter sets itself the task of correcting this misconception, and then drawing all the consequences in the context of directional physics.

The central thesis is this: a black hole is not an absence in space-time, but the most extreme form of presence that nature has manifested. It is a sphere, a delimited structure, massive, geometrically ordered and endowed with absolute directionality. Darkness is not a vacuum, it is a direction: everything that falls towards darkness is not lost in an abyss, it converges with absolute precision towards a center. Geometry never lies; it is language that lies.

The chapter proceeds in several stages. We will first establish what a black hole really is and why this word is inadequate, then we will redefine the object in the language of directional geometry. We will then see how three directional models, exponential division, directional coherence and dynamical toruses, regulate gravitational singularities. We will then move on to the dark sphere as a state of saturated matter, which will turn out to be true dark matter, an instrument for measuring real distances and the seat of a major geometric phenomenon, dimensional collapse. We will finish on the cosmic scale, with the Great Attractor understood as the central directional black hole.

What a black hole actually is

Definition and Schwarzschild radius

A black hole is a region of space-time in which the gravitational field is so intense that no information, no matter, no electromagnetic radiation, not even light, can escape beyond a critical boundary called the event horizon. This definition, which stems from Einstein's equations of 1915, does not contain any notion of hole, opening, or passage. It describes a bounded region, a physical object with measurable properties.

The first to solve Einstein's equations for such an object was Karl Schwarzschild, from the front of the First World War, in 1916, just a few weeks after the publication of general relativity. His

solution describes the geometry of space-time around a spherical, non-rotating, perfectly symmetrical mass. It is based on an essential quantity, the Schwarzschild radius:

$$r_s = \frac{2GM}{c^2}$$

where G is the universal gravitational constant, M is the mass of the object, and c is the speed of light in a vacuum. This radius is the critical size below which, if the entire mass of an object is compressed, an event horizon is formed. For the Sun it is about 3 kilometers, for the Earth barely 9 millimeters: this is an extraordinary density, but neither a vacuum nor an absence.

It is important to understand what r_s measures. It is not the size of a singularity, but the radius of the horizon, the sphere beyond which the speed of escape exceeds that of light. A solar-mass black hole therefore has a spherical horizon of about 3 km in radius, a mathematically defined surface.

A physical object with measurable properties

According to the no-hair theorem, a stationary black hole is entirely characterized by three quantities: the mass M, which determines the extent of its gravitational influence and the size of its horizon, the angular momentum J, i.e. the amount of rotation, and the electric charge Q, rarely significant in astrophysical practice but theoretically possible. An object defined by three real and measurable numbers is not a vacuum. It is a physical entity as real as a star or a planet, simply more extreme in its density and in the properties of the space-time that surrounds it.

For a rotating black hole, known as Kerr's black hole after Roy Kerr who published the solution in 1963, the structure can be read from the outside in. First we encounter ordinary space-time, an accessible region where geodesics can point in all directions, with normal but increasing gravity. Then comes the ergosphere, specific to Kerr's black holes, where space-time is driven in rotation to the point that even a "stationary" observer must rotate in the direction of the black hole, but from which it is still possible to escape. Then there is the outer horizon, the fundamental mathematical boundary, a sphere (or spheroid for Kerr) where the escape velocity reaches exactly c and where any future-directed trajectory points inwards. Beyond this is the inner horizon, the second critical surface associated with mass inflation, for which physics remains the subject of active research. Finally, at the center, the singularity, a point for Schwarzschild and a ring for Kerr, where the curvature diverges: it is not a place in space but a limit in time, the inevitable future of any inner trajectory.

Three misconceptions

Three erroneous representations are particularly widespread. The first is that a black hole "sucks in" everything, like a vacuum cleaner, even at a great distance. However, at a sufficient distance, its gravity is identical to that of any object of the same mass: if the Sun became a black hole, the Earth would continue to orbit normally, because attraction obeys the same laws.

The second makes it a passage or tunnel to another universe. In the sense of classical general relativity, the interior leads nowhere: any interior trajectory converges towards the singularity, and "blank verses" or other tunnels are unstable mathematical solutions with no confirmed observational basis. The third assimilates it to an infinitely small point or void. The horizon is instead a sphere of well-defined size: the supermassive black hole M87* has a horizon of about 38 billion kilometers in diameter, larger than the orbit of Pluto. It is a huge object, not a point.

The event horizon

The horizon is perhaps the most misunderstood concept in popular cosmology. It is imagined as a luminous wall or a veil of flames, whereas it is a mathematical boundary, defined by the geometry of space-time and not by a particular matter. It is the surface at any point at which the escape velocity is exactly equal to c ; below that, it would exceed c , which special relativity prohibits, and outside escape remains possible. It is neither a wall nor a door: it is the moment when the future ceases to have options.

The experience of the horizon depends radically on the observer. The one who falls freely crosses it in a finite proper time, without any local shock, and for a supermassive black hole, whose tidal forces on the horizon are relatively weak, the passage is imperceptible; only the constraint on its future trajectories, which all point towards the singularity, changes, irremediably. The distant observer, on the other hand, never sees the object cross the horizon: gravitational time dilation causes the image to "freeze" as it approaches the border, its light reddening exponentially to the point of invisibility. The horizon does not exist for the one who crosses it; it only exists for those who remain outside.

Hawking radiation and entropy: the proof of a surface

In 1974, Stephen Hawking combined general relativity and quantum field theory to show that black holes are not perfectly black. By a mechanism related to the creation of particle-antiparticle pairs near the horizon, a black hole emits thermal radiation of temperature:

$$T_H = \frac{\hbar c^3}{8\pi G M k_B}$$

where $\hbar$ is the reduced Planck constant and k_B is the Boltzmann constant. This temperature is inversely proportional to the mass; a black hole with a solar mass reaches about 6×10^{-8} kelvin, practically zero on the astrophysical scale. Such radiation implies entropy, given by the Bekenstein-Hawking relation:

$$S = \frac{A}{4} \quad (\text{en unités de Planck})$$

where A is the area of the horizon. This formula relates a thermodynamic property to a geometric property, the area of the sphere-horizon, and confirms that the horizon is indeed a measurable surface, not a point or a void.

Sphere and non-funnel

The diagram of the "rubber sheet", with its funnel where a massive object deforms a planar membrane, is one of the most widely used and misunderstood illustrations. It does not represent the shape of a black hole but a two-dimensional projection of the curvature around a massive object, a pedagogical metaphor and not a photograph. A real black hole does not have a pointed "bottom" to fall towards: its geometry is spherically symmetrical, or spheroidal for a rotating black hole.

For Kerr, the horizon is an oblate spheroid, slightly flattened at the poles by rotation, but still a closed, convex surface, without an opening. The spherical symmetry is broken by rotation, the topology remains that of a sphere. Nowhere in the exact geometry of Schwarzschild or Kerr is there a funnel, tunnel or opening.

Why the word "hole" is misleading

The word "hole" conjures up, in all languages (hole, Loch, buco), a coherent mental schema: an empty space delimited by a surface, an opening allowing passage, an absence within a presence. However, physics establishes point by point the opposite. Where "hole" suggests a vacuum, the black hole contains a gigantic mass, millions or billions of solar masses for supermassive ones. Where it suggests an opening, nothing can leave the horizon: it is an absolute enclosure. Where it suggests an absence of geometry or structure, geometry is precisely defined, spherical or spheroidal, with ergosphere, multiple horizons and singularity, each obeying precise equations. Where it suggests the passive and the hollow, the black hole radiates, accretes matter, emits relativistic jets and generates gravitational waves during mergers.

The term black hole was popularized by John Archibald Wheeler at a conference in 1967, although its informal use preceded it. Wheeler was looking for a strong and memorable term, and he succeeded too well. In *Geons, Black Holes, and Quantum Foam* (1998), he notes that he did not invent it but adopted it, and that he knew that "hole" was an image and not a description. Previously, more clumsy but more accurate designations had circulated: "collapsed star," "Schwarzschild object," or the Soviet expression *zvezdá, zamershaya vo vremeni*, "star frozen in time."

Metaphor has measurable consequences. Students exposed to the term without correction systematically imagine an object into which one can fall from any direction and emerge on the other side, an object that actively sucks in like a drain, an object without a defined boundary, a simple space that becomes darker and darker. These intuitions persist after formal teaching because they are rooted in the semantic structure of the word: the metaphor of the hole surpasses physics in mental architecture. Primitive representations are extraordinarily resistant, and a child who learns that black holes are holes will still, at thirty years of physics, be inclined to see them as an opening rather than a border.

It is telling that the most rigorous theorists have always used precise geometric language in their technical work. Penrose speaks of the "trapping surface" and singularity, Thorne, with Wheeler

and Misner in *Gravitation*, describes the horizon as a surface, and Hawking reasons in terms of the area of the horizon, a quantity that presupposes a surface and not a hole. The architects of the field thought in spheres, surfaces and geodesics, but spoke to the public of "hole": two representations of the same reality were thus dug out, one correct, the other seductive but false.

Hence the author's terminological proposal: to gradually adopt "black sphere", a geometrically precise term that retains the idea of darkness by restoring the real form, or "extreme gravitational sphere", a descriptive term that highlights the physical nature of the object rather than its appearance. These designations orient intuition towards reality rather than a visual fiction. To call a black sphere a "hole" is not to simplify, it is to reverse: presence is replaced by absence, structure by emptiness, geometry by lack. To say "black sphere" rather than "black hole" is not to change a name, it is to change an image of the world.

This rectification is extended into pedagogical proposals: to introduce the spherical shape of the horizon from the first contact rather than the funnel diagram, which invariably produces the metaphor of the tunnel; to accompany the term "black hole" with an explicit correction, reminding us that it is a historical metaphor and that, physically, it is a sphere of extreme gravity; to promote the circular shadow obtained by the Event Horizon Telescope as a canonical, true, available and round representation; to introduce the directionality of the fields, with the arrows converging spherically towards the centre, as a visualisation tool without the metaphor of the vacuum; and finally to gradually replace the term in textbooks with "extreme gravitational sphere" or, in technical contexts, with "Schwarzschild/Kerr object".

The directional geometry of the dark sphere

The directional postulate

Directional physics describes physical structures not only by their scalar properties, mass, energy, charge, but by the directional geometry of their field interactions. Its founding postulate is that an object is not only defined by what it contains, but by the directional structure of the fields it generates in the surrounding space. Each point in space around a massive object has a vector, a preferential direction imposed by the gravitational field, and all of these vectors form a directional signature that is part of the object's identity: an object is not only its mass, it is also the direction it imposes on the world around it.

The directional geometry of a gravitational object is thus the vectorial structure of its field at any point, defined by the set of accessible future geodesics, i.e. the trajectories that an object can take free of any other force. It is a global property of the region of space-time dominated by the object, and not just a local property.

Maximum directionality

At any point outside the horizon, the black hole's field defines a perfectly radial vector of attraction, pointing toward the center of mass. This directionality is spherically symmetrical: from any point, the direction points to the same center, which is by definition the signature of a sphere. But what distinguishes the black hole from any other massive object occurs at the horizon and

beyond: directionality becomes absolute, there is no longer any future-directed vector that does not point inward, and all causally permissible paths converge toward the center.

The black hole is therefore an object with maximum directionality, since beyond the horizon only one direction is physically permitted, inwards. It is also an object with spherical symmetry of directionality, this absolute directionality being identical in all angular directions, and an object where it is irreversible, because no other gravitational field is so devoid of a trajectory of return beyond its boundary.

The horizon then receives a new definition: it is the surface from which the directionality of the gravitational field becomes absolute, the surface below which no future-directed vector can point outwards. This definition is strictly equivalent to the classical definition (escape velocity equal to c), but it reveals its deep structure: the horizon is not simply a quantitative limit, a radius or a temperature, it is a qualitative boundary between two directional regimes, the one where the paths are free and the one where they are absolutely constrained.

Agreement with general relativity

In general relativity, objects free of any non-gravitational force follow geodesics. Inside the horizon, all future-directed geodesics end at the singularity, and none deviates from it: this is precisely what directional physics calls absolute directionality, the convergence of all free trajectories towards a single point. Roger Penrose rigorously demonstrated this in his 1965 singularity theorems, which earned him the Nobel Prize in Physics in 2020: under reasonable conditions, the formation of a horizon necessarily implies a singularity. Absolute directionality and singularity are two sides of the same geometric truth.

Applications

During the merger of two black holes, such as the one detected by LIGO in 2015 (GW150914), the directional geometries of two spheres interact, deform and merge into a single structure, releasing in a few hundredths of a second a gravitational energy equivalent to about three solar masses. Understanding this merger as the collision and reconciliation of two complete directional geometries offers a richer picture than the language of curvature alone.

The information paradox also takes a new form: if all the inner trajectories converge towards the singularity, how can quantum information emerge through Hawking radiation? In directional terms, it is the paradox of a directionality that is locally irreversible but should be globally reversible. The framework does not solve it at this stage, but it names it with a new geometric precision.

Finally, the images of M87* published by the Event Horizon Telescope in April 2019 show what directional physics predicts: a circular shadow, a spherical imprint of maximum directionality, surrounded by a luminous ring of photons in unstable orbit. The shape of this shadow is not accidental, it is the projection of the directional sphere onto the plane of the sky.

Regularization of gravitational singularities

The Problem

General relativity is the most accurate description of gravitation at all observational scales, but it carries with it the seeds of its incompleteness: under extreme conditions, Einstein's equations generate regions where the curvature and energy density diverge. The theorems of Penrose (1965) and Hawking and Penrose (1970) show that, under generic conditions, spacetime contains incomplete geodesics. The two archetypes are the central singularity of black holes at $r = 0$ and the initial singularity of the Big Bang at $t = 0$ in the Friedmann-Lemaître-Robertson-Walker models.

Loop quantum gravity, string theory, and bounce cosmology have attempted to solve or circumvent them. The directional framework chooses another path: acting on the directional structure of spacetime itself, without quantifying gravity or changing the structure of matter. Its central hypothesis is that singularities are not inevitable physical realities, but the product of a mismatch between the scalar description of divergences and the inherently vectorial and tensor nature of geometric fields. Where classical relativity sees an irreducible scalar divergence, the directional framework identifies a directional redirection that, properly formalized, remains bounded and physically significant. It rests on three pillars: exponential division, directional coherence, and dynamic toruses.

The exponential division

In classical Riemannian formalism, when a denominator $f(x)$ approaches zero, the quantity $a/f(x)$ diverges isotropically, without a preferred direction of avoidance, and this divergence propagates to the components of the Riemann tensor and the Ricci scalar, rendering geometry indefinite. Exponential division is an operator that, when $f(x) \rightarrow 0$, does not produce this scalar divergence but redirects the divergent quantity in an exponential direction of the geometric phase space:

$$D_{\text{exp}}(a, f(x)) = a \exp\left(\frac{\kappa}{f(x)}\right) \hat{e}_r \quad (\text{Éq. 1})$$

Here $\kappa > 0$ is a homogeneous regularization parameter at a characteristic length, typically of the order of the Planck length l_P , and $\hat{e}_r$ is the unit vector of redirection in the space tangent to the manifold. The divergence is absorbed in the exponential phase rather than in the scalar amplitude. The operator is a vector object: its magnitude can in principle diverge, but its direction remains defined and continuous, which allows a coherent geometric treatment in the vicinity of $f(x) = 0$.

This divergence is consistent with the direction $\hat{e}_r$: it does not propagate in transverse directions. This directional containment of divergence is the central mechanism of regularization and what fundamentally distinguishes exponential division from a simple ultraviolet cut.

The textbook case is the Schwarzschild metric:

$$ds^2 = -\left(1 - \frac{2GM}{rc^2}\right)c^2 dt^2 + \left(1 - \frac{2GM}{rc^2}\right)^{-1} dr^2 + r^2 d\Omega^2 \quad (\text{Éq. 2})$$

The term $(1 - 2GM/rc^2)^{-1}$ diverges when $r \rightarrow r_s = 2GM/c^2$, at the horizon. This divergence is a coordinate singularity, eliminable by a change of coordinates (Eddington-Finkelstein, Kruskal-Szekeres), but it illustrates the structure of the problem that exponential division deals with. The physical singularity at $r = 0$, which persists in all coordinate systems and where the Kretschmann scalar $K = R_{\mu\nu\rho\sigma}R^{\mu\nu\rho\sigma} = 48G^2M^2/c^4r^6$ tends to infinity, is part of the same formal structure. Setting $f(r) = 1 - 2GM/rc^2$, the operator applied to the radial term gives the regularized metric:

$$g_{rr}^{\text{exp}}(r) = \exp\left(\frac{\kappa}{r-r_s}\right)\hat{e}_r, \quad r \rightarrow r_s \quad (\text{Éq. 3})$$

This component remains a well-defined vector in tangent space for all $r > 0$. The associated scalar curvature is bounded in the directional direction, the divergence being absorbed in the exponential phase and not in a scalar component of the Riemann tensor. And the singularity of coordinates in $r = r_s$ becomes a bounded directional redirection, interpretable as a localized geometric anisotropy. For a distant observer, the approach to the horizon classically translates into a divergence of the radial metric; here, this divergence is a directional rotation in tangent space: the geometry is not infinite, it is maximally anisotropic in the radial direction, a regular and continuous configuration.

The operator respects the symmetries of general relativity. It is covariant under the diffeomorphisms, the vector $\hat{e}_r$ transforming tensorially, which preserves the gauge invariance. Outside the neighborhood of r_s , for $f(r) \gg \kappa$, it reduces to the classical value $a/f(r)$ at the first order in $\kappa/f(r)$, ensuring compatibility with Einstein's equations with small curvature. Finally, the regularized equations satisfy, at the first order outside the neighborhood of r_s , the covariant conservation $\nabla_\mu T_{\mu\nu} = 0$, guaranteeing the thermodynamic coherence of the frame.

Directional consistency

Exponential division is a local regularization; directional coherence is the global constraint. It is the property of a tensor field $T_{\mu\nu}$ that preserves the continuity of its dominant eigendirection over the entire manifold, even under strong curvature. We define the directional coherence tensor:

$$C_{\mu\nu} = \nabla_\lambda (T_{\mu\nu} n^\lambda) = 0 \quad (\text{Éq. 4})$$

where n^λ is the dominant eigenvector of $T_{\mu\nu}$, associated with the eigenvalue of the largest absolute value, and ∇_λ the covariant derivative compatible with the metric. The condition $C_{\mu\nu} = 0$ expresses that the covariant transport of $T_{\mu\nu}$ in the direction of its dominant eigenvector is zero: the dominant direction is self-parallel for the transport defined by $T_{\mu\nu}$ itself.

Physical interpretation is central: at any point in space-time, even in the immediate vicinity of a classical singularity, there is a preferential direction of transport that remains geodesically defined and regular. The singularity is not a region where all directions diverge at once, but a region where the dominant direction concentrates the anisotropy, the transverse directions remaining regular.

The main result is that this condition is necessary and sufficient for the bounditude of the Kretschmann scalar,

$$K = R_{\mu\nu\rho\sigma} R^{\mu\nu\rho\sigma} \quad (\acute{\text{E}}\text{q. 5})$$

even when individual components of the Riemann tensor diverge. If $C_{\mu\nu} = 0$ is satisfied globally, the contractions that form K undergo systematic directional cancellations that keep it bounded. There is then a consistent metric $g(\text{coh})_{\mu\nu}$ such that the modified Einstein equation is written:

$$\text{Ric}(g^{\text{coh}}_{\mu\nu}) = \lambda g^{\text{coh}}_{\mu\nu} + T^{\text{dir}}_{\mu\nu} \quad (\acute{\text{E}}\text{q. 6})$$

where λ is a constant analogous to the cosmological constant and $T(\text{dir})_{\mu\nu}$ is a directional correction tensor that absorbs unbounded curvature residues by redistributing them in the coherent directions of the field. This tensor is entirely determined by the eigenstructure of $T_{\mu\nu}$ and is not an ad hoc free parameter.

The two mechanisms are compatible: if $T_{\mu\nu}$ satisfies $C_{\mu\nu} = 0$ before exponential regularization, the regularized metric $g(\text{exp})_{\mu\nu}$ also satisfies it. The Dexp operator acts in the directions already identified by the directional coherence, so that the exponential redirection and the covariant transport constraint are co-aligned and can be composed without conflict. Their combination provides the formal substrate on which the dynamic toruses operate.

Dynamic toruses

The third pillar is the geometric realization of the first two. Space-time in the immediate vicinity of a classical singularity admits a topological decomposition:

$$\mathcal{M}_{\text{singulière}} \simeq T^2 \times M^2 \quad (\acute{\text{E}}\text{q. 7})$$

where T^2 is a two-dimensional torus and M^2 a two-dimensional Lorentzian manifold. The torus is the most natural compact topology that admits a flat geometry, with zero Gaussian curvature, and a non-zero minimal spatial extension, two properties required by the previous mechanisms. It is parameterized by the angles $(\theta, \phi) \in [0, 2\pi) \times [0, 2\pi)$, with a major radius $R(t)$, distance from the center of the torus to the axis of revolution, and a minor radius $r(t)$, radius of the circular section, both functions of cosmic time t :

$$ds^2_{\text{tore}} = -dt^2 + R^2(t) d\theta^2 + (R(t) + r(t)\cos\theta)^2 d\phi^2 \quad (\acute{\text{E}}\text{q. 8})$$

This is the standard induced metric on a torus immersed in $\mathbb{R}^3$, extended to a Lorentzian manifold. The radii evolve according to coupled Euler-Lagrange equations, derived from an effective potential:

$$\ddot{R}(t) = -\frac{\partial V_{\text{eff}}}{\partial R}, \quad \ddot{r}(t) = -\frac{\partial V_{\text{eff}}}{\partial r} \quad (\text{Éq. 9})$$

where $V_{\text{eff}} = V_{\text{eff}}(R, r, K, C_{\mu\nu})$ depends on the toroidal radii, the Kretschmann scalar and the coherence tensor. This potential admits a minimum that is not degenerate at $r = r_{\text{min}} > 0$, the fundamental mechanism of regularization. When the singularity is approached, i.e. when $r(t) \rightarrow 0$ in the classical regime, the potential becomes repulsive and prevents the collapse of the minor radius beyond r_{min} . The torus degenerates not at a singular point but at a circle with radius $R(t) > 0$, preserving a finite-dimensional topology S^1 . The minimum extension is:

$$r_{\text{min}} = \frac{\kappa \hbar c}{GM} \quad (\text{Éq. 10})$$

This expression is analogous to the generalized Planck length $l_P = \sqrt{\hbar G/c^3}$, modulated by κ and by the mass M of the object. For $M \rightarrow 0$, $r_{\text{min}} \rightarrow \infty$, which is consistent with the fact that zero-mass objects do not generate singularity. The minimum toroidal structure is smaller the larger the mass, in qualitative agreement with the predictions of loop quantum gravity for microscopic black holes: for a black hole of solar mass ($M \approx 2 \times 10^{30}$ kg), with $\kappa \sim 1$, we obtain $r_{\text{min}} \sim l_P / (M/m_P) \sim 10^{-76}$ m, well below any directly observable scale.

This structure is not postulated ad hoc: it is the natural realization of directional coherence. In the regime of strong curvature, the eigendirections of $C_{\mu\nu}$ align with the generators (θ, ϕ) of the torus: the dominant eigenvector n_λ is tangent to the generator ϕ , the main toroidal direction, and the second aligns with the generator θ , polar direction. Toroidal geometry is therefore not a simple regularization of singularities, but their intrinsic geometric representation in the directional framework.

The unified system

The three models form a hierarchical system where each conditions and completes the next. Exponential division, a local operator, acts point by point by replacing divergent terms with bounded directional vectors. Directional coherence, a global constraint, ensures that these local regularizations are mutually compatible and do not generate new large-scale singularities. Dynamic toruses provide the compact topology where these mechanisms materialize, with a non-zero minimum extension. The master equation of the framework is the regularized field equation:

$$G_{\mu\nu}^{\text{reg}} = G_{\mu\nu}^{\text{Einstein}} + C_{\mu\nu}^{\text{coh}} + T_{\mu\nu}^{\text{tore}} = \frac{8\pi G}{c^4} T_{\mu\nu}^{\text{matière}} \quad (\text{Éq. 11})$$

where $G(\text{Einstein})_{\mu\nu} = R_{\mu\nu} - 1/2 R g_{\mu\nu}$ is the classical Einstein tensor, $C(\text{coh})_{\mu\nu}$ the coherence correction tensor defined in (Eq. 6) and $T(\text{torus})_{\mu\nu}$ the effective energy-momentum tensor of the toroidal structure. $G(\text{reg})_{\mu\nu}$ is finite at any point in the regularized manifold, including the positions corresponding to the classical singularities at $r = 0$ and $t = 0$. At low curvature, the equation reduces to the classical Einstein equations.

Applied to the Big Bang of the flat FLRW model, where $a(t) \rightarrow 0$ results in a density $\rho \sim a^{-4} \rightarrow +\infty$ for a radiation-dominated universe, the master equation replaces the singularity with a state of finite maximum density:

$$\rho_{\max} = \frac{c^5}{G^2 \hbar} \approx 5,16 \times 10^{96} \text{ kg} \cdot \text{m}^{-3} \quad (\text{Éq. 12})$$

This density, of the order of Planck's density, is reached on an initial dynamic torus T^2_o of non-zero R_o and r_o radii. The singularity becomes a cosmological rebound: the anterior universe, in contraction, reached $\rho_{\max}$ on the torus before re-expanding in the observable post-Big Bang phase, a rebound entirely directed by directional coherence, which guarantees the continuity of the eigendirections of the energy-momentum tensor through it.

For a black hole of mass M , the central singularity at $r = 0$ is replaced by a minimum dynamical torus $T^2_{\min}$ of radii $R_{\min}$ and $r_{\min}$ given by (Eq. 10). The causal structure is modified only in a region of size $r_{\min}$ around the classical origin, the Schwarzschild geometry remaining unchanged on the outside. This has a consequence for the paradox of Hawking information: the information that falls is not destroyed at a singularity that no longer exists, but redistributed on the compact and regular toroidal surface $T^2_{\min}$, the geometric register of incident information. Its recovery by a modified Hawking radiation remains an open problem, but formally posed.

Comparison and outlook

Compared to classical relativity, which tolerates singularities as inevitable, loop quantum gravity, which suppresses them by the quantum granularity of spacetime, and string theory, which avoids them by the nonzero fundamental extension of strings, the directional framework is distinguished by two features. It does not impose any modification of the quantum structure of spacetime, operating entirely within the classical and semi-classical regime of general relativity, and its tools, exponential division and coherence tensor, are formally new, with no exotic algebraic structures or additional dimensions. Its internal coherence lies in the logical hierarchy of the three models, and it does not contain an ad hoc free parameter: the only regularization parameter, κ , is dimensionally constrained by the Planck length, and its natural value is $\kappa \sim 1$ in Planck units.

Future avenues are mapped out: quantifying the toroidal rays $R(t)$ and $r(t)$ in a minisuperspace, to obtain a quantum version of the master equation analogous to the Wheeler-DeWitt equation; searching in the cosmological rebound for a primordial spectrum of gravitational waves with a low-frequency cut-off and an excess of power on the Planck scale, observable by next-generation detectors such as LISA or BBO; constraining $r_{\min}$ by the shadow shape of black holes with a next-generation EHT at sub-microsecond arc resolution; and finally extending the framework to Kerr and Reissner-Nordström spacetimes, where the non-stationarity of the toroidal structure and the definition of coherence in axisymmetric geometries pose additional challenges.

The dark sphere: saturated matter

The final state of matter

The previous sections have described the dark sphere from the outside, by its horizon, its directionality and the regularization of its center. We must now describe its matter. In a directional cosmology, the dark sphere is not an abstract singularity but a real physical object: the densest, most massive and most saturated in the universe, the final state of matter, where the internal dimensions are saturated, where directional geometry collapses and where no vibration, no emission, no light interaction is possible.

This matter exceeds all known states, baryonic, neutron, degenerate, quarkic or exotic. The density reaches its directional maximum, the geometric compression is total, the mass is confined in the smallest possible directional volume and no internal structure remains. Matter no longer has degrees of freedom, no internal directions available, no more exploitable geometry: it is the heaviest matter possible, because its dimensions are saturated.

Dimensional saturation

Dimensional saturation is the point where all internal directions are compressed to their limit, internal geometry collapses, axes of vibration are cancelled, degrees of freedom disappear, and matter ceases to be atomic, nuclear, or neutron. Saturated matter no longer has structure, internal volume, vibration, light, or usable direction; it can no longer deform, move, expand, or interact. This is the most extreme state that directional physics can describe.

It explains why this matter is the heaviest. Mass is no longer a property but a collapsed geometry: density reaches its directional maximum, internal tension is absolute, geometric compression is total, and no matter can be denser or more massive. It is this matter, and only it, that deserves the name of true dark matter.

Why it is invisible

Light requires internal space, geometry, vibration, direction, and structure. In a dark sphere, all of this is absent: saturation suppresses internal directions, collapses geometric axes, cancels vibrations, and prohibits any emission, absorption, or reflection. Saturated matter does not emit light, absorbs light, reflects, or lets it through. It is physically invisible, not by magic, but by the total absence of available internal dimensions. It is the only truly dark matter in the universe.

Directional polarity of matter and antimatter

In directional physics, matter and antimatter do not differ only in their charge: they have opposite directional polarities. In a dark sphere, saturated matter carries a positive directional voltage and saturated antimatter a negative directional tension. These tensions are extreme, total, incompatible and irreconcilable. A black sphere is therefore not an irreversible state: when two opposite dark spheres meet, their internal saturations enter into direct contradiction, which can be resolved neither by fusion nor by stabilization.

True Dark Matter

For nearly a century, classical cosmology has been searching for invisible matter to explain excessively high rotational speeds, missing masses, immense gravitational halos, distortions of light trajectories, and an expansion that accelerates without any apparent cause. It named this entity dark matter without ever detecting, observing or defining it, and multiplied imaginary particles (WIMPs, axions, neutralinos), speculative fields and artificial models. In a directional universe, this confusion disappears: true dark matter is the saturated matter of dark spheres. It is exactly what cosmology was looking for, but it didn't know where to look.

This matter is real, massive, invisible, undetectable, confined, and geometrically saturated. Dark spheres distort the metric around them, and this deformation creates directional halos, internal tensions, extreme curvatures, compression zones, and illusions of invisible mass. Classical cosmology believes it sees a mysterious mass and an unexplained halo; in reality, it observes the geometry distorted by the saturated matter of a dark sphere. Dark matter halos are not halos of invisible particles, they are geometric halos, produced by dimensional saturation.

Galactic rotational speeds provide an illustration of this. Galaxies rotate too fast for the visible mass they contain, and classical cosmology infers that an unknown substance stabilizes them. In directional physics, the central black sphere propels the galaxy; its directional voltage increases the apparent velocity; its dimensional saturation distorts the metric; light overestimates the true distance, so that the visible mass appears insufficient. What cosmology calls "missing mass" is simply the saturated mass of the dark sphere, invisible but real.

As a result, dark matter is not omnipresent. Classical cosmology imagines it to be homogeneous and distributed throughout the universe; directional physics says it is localized, confined, directional, concentrated in the dark spheres. It is not a diffuse cosmic substance, but the heaviest matter in the universe, enclosed in saturated structures. It produces gravitational halos, internal tensions, metric deformations and all the effects attributed to classical dark matter, and it is the only one that can measure the real compression of space-time, determine the shortest possible true distance, understand superluminal dynamics and explain accelerated expansion.

Saturated mass and actual distance

Light never shows true distance

Classical cosmology determines the distance between two objects by the light they emit, the time it takes to reach us, the observed light path, and the measured redshift. In a directional universe, this method is fundamentally wrong, because light passes through distorted metrics, living geometry, contracted and dilated regions, directional twists, and cosmological rotations. It never follows the real path, it follows the distorted path. The luminous distance is an illusion; the actual distance is shorter; and only saturated matter can measure it.

Mass as a measure of metric compression

In this physics, the mass of a black sphere is not a classical quantity: it is a direct indicator of metric compression and dimensional saturation, a measure of directional compression, internal tension, collapsed density, and the actual geometry of space-time. The more massive a black sphere is, the more the metric is contracted around it, the more the real geometry is compressed, the more the light distance is distorted, and the shorter the actual distance. Saturated mass becomes a natural cosmological instrument, a revealer of real structure. Light lies; the black sphere tells the truth.

In a region where the metric is deformed by a black sphere, the real distance D_r is given by:

$$D_r = D_l f^{-1}(g_{\mu\nu})$$

where D_l is the observed luminous distance, $f(g_{\mu\nu})$ the metric deformation, f^{-1} the directional correction, and $g_{\mu\nu}$ the local geometry influenced by the black sphere. The saturated mass M_s directly determines this geometry:

$$g_{\mu\nu} = g_{\mu\nu}(M_s)$$

The mass of a black sphere therefore determines the real contraction of space-time, and this contraction determines the real distance, which is always shorter than the luminous distance. It can also be expressed as:

$$D_{\text{réelle}} = D_{\text{lumière}} - \Delta D(M_s)$$

where $\Delta D(M_s)$ is the light distance lost due to metric deformation. The more massive the black sphere, the greater the deformation, the more deceptive the light, and the shorter the actual distance.

A cosmological unit of measurement

By knowing the mass of a black sphere, we can calculate the directional contraction, the local torsion, the saturated density, the internal tension and the collapsed geometry, thus reconstructing the real path, the real distance and the shortest possible trajectory. Light reveals a distorted path, saturated matter reveals the real path. The dark sphere thus becomes a geometric coordinate system, a tension indicator, a density marker, a deformation standard, a unit of density, tension, compression, geometry and real distance: the instrument that makes it possible to measure cosmic reality.

The Dimensional Collapse

When a black sphere of matter and a black sphere of antimatter, of opposite polarities, enter into direct interaction, their directional tensions clash and their saturations become incompatible: the opposite tensions neutralize each other, the collapsed geometry loses its coherence, the saturated dimensions break. This is dimensional collapse, which leads to the total destruction of the two spheres, and the only way to destroy a dark sphere, i.e. true dark matter.

It is not a classical energetic annihilation, nor a nuclear reaction, a fusion or a chemical explosion: it is a geometric disintegration. The internal dimensions reopen, the compressed space-time is freed, the metric is suddenly re-expanded, the directional compression disappears, and a directional wave propagates in the region. The saturated matter disappears completely.

This wave carries the geometric reset, modifies the surrounding metric, influences local dynamics, and can be detected as a microwave background or directional variations; it is the geometric equivalent of the residual radiation of a classical Big Bang. The phenomenon thus produces a sudden expansion, a liberation of space-time, a cosmic wave and a local geometric reset, which corresponds exactly to what cosmology describes as a Big Bang: abrupt expansion, release of energy, apparent creation of space, initial warming, propagation of a microwave background. A dimensional collapse therefore resembles a Big Bang, and a Big Bang can be interpreted as the consequence of a dimensional collapse. The affected region behaves like a newly formed space, even if it is not created, simply reopened; it is not an absolute beginning but a geometric rupture caused by the destruction of two opposing black spheres.

This rapprochement is echoed in the regularization studied above, where the singularity of the Big Bang is replaced by a bounce off a torus with finite maximum density. In both cases, the origin is not a point where physics ceases, but a continuous geometric transition. Dimensional collapse plays a major role in the cosmic structure: it destroys saturated masses, regulates extreme density, resets entire regions of space-time, generates local expansions, and produces signatures similar to those of a Big Bang. It is one of the fundamental drivers of cosmic dynamics.

The Great Attractor: Central Directional Black Hole

The limits of standard cosmology

We are now changing scale. The Great Attractor, located in the Hydra-Centauri region, influences the motion of the Milky Way, Andromeda, the Local Group and even the Virgo supercluster, and its exact nature remains unknown. The directional hypothesis is that it is a supermassive black hole generating a geometric distortion on a cosmic scale, and that several Large Attractors of this type could exist, forming a network of directional flows that structure cosmic dynamics. Black holes are, as everywhere in this framework, not only gravitational singularities but geometric engines capable of transporting space.

Classical cosmology is based on two principles: the universe has no center, and the expansion is uniform. However, several observations contradict them. The Great Attractor exerts a massive directional influence; the Milky Way moves at about 600 km/s towards a specific region; Andromeda moves closer to the Milky Way instead of away from it; superclusters do not move away symmetrically; some regions accelerate while others slow down. The expansion is therefore not homogeneous, and directional flows exist on a large scale.

The directional behavior of a saturated black hole

In directional physics, a saturated black hole transports the surrounding space, creates a geometric flow, generates directional distortion, and acts as a natural engine. This behavior is

observed on a small scale in distorted stellar orbits, relativistic jets, extreme rotation, and the local curvature of spacetime. The hypothesis is to extend it to the cosmic scale.

If the Large Attractor were a supermassive black hole, a giant directional distortion would be created, galaxies would be driven in a preferred direction, the symmetry of the expansion would be broken, the motion of the Local Group would be explained, and the convergence of the Milky Way and Andromeda would become coherent. A directional center would emerge, rather than a geometric center. This idea aligns with the dynamics of saturated black holes, with SMD propulsion, with the structure of the VSMD spacecraft, and with the geometric fluxes observed on a small scale.

A network of Great Attractors

If a supermassive black hole can structure an entire supercluster, it makes sense to assume that each major supercluster has its own directional attractor: a network of Large Attractors, each of which is a saturated supermassive black hole generating a local directional flow and influencing the dynamics of its environment. The universe then ceases to be homogeneous and consists of zones of flux, zones of saturation, zones of geometric tension, and zones of directional vacuum. Each supercluster becomes a directional cell: it has its attractor, follows a directional geodesic, interacts with neighboring attractors, and forms a fractal cosmic structure. The expansion becomes composite, modulated, distorted by attractors, and structured by fluxes.

The cosmological consequences are those of a directional architecture: multiple flow centers rather than a single point of origin; galaxies that follow geometric currents, like particles in a directional fluid; galactic collisions that become predictable, because they represent directional convergences rather than random events. The Great Attractor is just one example, and one can imagine Mega-Attractors, secondary attractors, forming attractors, and saturated attractors.

This table reinforces the coherence of directional physics. SMD propulsion mimics the directional behavior of black holes, the VSMD spacecraft uses saturated geometry to transport space, and the Large Attractors are the cosmic version of this phenomenon: they function as SMD black holes on the scale of the universe. This hypothesis is consistent with observational anomalies, consistent with directional physics, uncontradicted by standard cosmology, and capable of explaining large-scale galactic motions.

Conclusion: the sphere, geometric truth

A black hole is a sphere. Its horizon is a closed, geometrically defined, thermodynamically measurable, and physically real surface; its mass is concentrated, not absent; its structure is complex, nonzero; its directionality is absolute. Its center is not an abstract singularity: exponential division redirects divergences, directional coherence preserves the continuity of eigendirections, and the dynamical torus ensures a minimum nonzero extension, so that the master equation remains finite everywhere.

Its matter, dimensionally saturated, is the heaviest in the universe; invisible, undetectable and confined, it is the true dark matter, which produces halos, explains galactic rotations and reveals,

by its mass, the real contraction of space-time and the true distance, shorter than that shown by light. When two dark spheres of opposite polarities meet, the dimensional collapse destroys them and releases compressed space-time in an expansion that resembles a Big Bang. At the scale of superclusters, central directional black holes, including the Great Attractor, structure the universe into flux cells.

The dark sphere waits, at the center of our galaxy, 26,000 light-years away, as it is at the heart of every massive galaxy in the observable universe. It has always been a sphere; it has simply taken us a long time to do it justice. And the direction it imposes, absolute, irreversible, spherically perfect, is one of the purest geometric truths written in the fabric of space and time.

Chapter 9 — Directional Cosmology

Introduction

At all scales accessible to observation, the Universe bears the signature of a rotating fluid. Solar systems are born in spiral disks, galaxies organize themselves into massive vortices around attractor centers, cosmic filaments stretch and coil like giant arms, and superstructures reveal coherent currents that travel hundreds of millions of light-years. These patterns are neither local accidents nor exceptions: they constitute a universal pattern, vortex dynamics.

This chapter brings together the cosmology of directional physics in a single presentation. It starts from a simple principle: space-time behaves like a rotating fluid, and this rotation generates vortices at all scales. From this principle flow a hierarchy of nested structures, a universal vortex with an axis and a center, an expansion that is neither uniform nor isotropic, and an entirely new reading of what we observe: light, passing through a living metric, never carries pure information.

The chapter unfolds in three parts. First, it describes the cosmic rotation, the vortexes, and the center of the universal vortex. It then establishes the equations of directional metrics and draws the consequences for the apparent position, distance, and velocity of galaxies, as well as for expansion, dark energy, and missing matter. Finally, it expands to the higher scale, the Omniverse, and to the question of the simulation and creation of a universe, which brings cosmology back to its most elementary laws: the string, its poles, and its constant energy.

This cosmology does not aim to replace existing models with an additional adjustment, but to propose a coherent, fluid and geometric alternative, where rotation plays a central role. It can be summed up in one sentence: if the observed structures look like vortexes, it may be because the Universe is a vortex.

1. Space-time as a rotating fluid

1.1 The Fundamental Principle

Traditional cosmological models describe the universe as a uniformly expanding space with no axis, no center, and no overall rotation. This view is based on mathematical assumptions, isotropy,

and homogeneity, rather than on direct observation of cosmic structure. But the structures we observe are neither isotropic, homogeneous, nor static: they are spiral, filamentary, directional, and coherent.

These patterns are characteristic of a fluid subjected to rotation. In such a fluid, matter is organized into disks, currents stabilize in spirals, density zones are structured in vortices, filaments emerge as streamlines, and gradients are naturally hierarchical. The hypothesis of a rotating fluid space-time accounts for all these structures without resorting to independent mechanisms or ad hoc adjustments.

1.2 The Cosmic Fluid

In this cosmology, space-time is not a simple geometric framework. It is treated as a continuous fluid, endowed with dynamic properties: circulation, internal tension, directional coherence, rotational capacity, current formation, wave propagation, and vortex stability. This fluid is not a material substance; it is a dynamic description of geometry itself, of the internal dynamics of cosmic geometry.

The Universe is therefore not an empty space, but a dynamic medium where structures emerge naturally from rotation. The rotation of this fluid imposes a privileged direction, an overall axis and a fractal organization of structures. In a rotating fluid, structures are not distributed at random: they are organized into spirals, filaments, disks and vortices, which are precisely the shapes revealed by the cosmos.

1.3 Cosmic Centrifugal Force and Directional Coherence

A global rotation produces a centrifugal force that acts on the geometry of space-time. This force stretches the fluid, increases distances, accelerates expansion and promotes the formation of spiral structures. In this context, the accelerated expansion of the Universe is not a mysterious phenomenon: it is a natural consequence of global rotation.

A rotating fluid also has an essential property, directional coherence. Currents follow lines of rotation, structures align along the global axis, vortices emerge spontaneously, filaments form like spiral arms, and areas of density stabilize around attractor centers. This coherence, visible in spiral galaxies, solar systems, filaments, and superstructures, suggests that rotation is not a local phenomenon but a universal dynamic.

1.4 Dynamic geometry

The rotation of the cosmic fluid imposes a dynamic geometry on the Universe: flattening, formation of disks, emergence of spirals, organization into filaments and the possibility of a global toric structure. The geometry of the Universe is not imposed by an abstract mathematical model; it emerges from the dynamics of the cosmic fluid.

2. Vortexes, fundamental structures of the cosmos

2.1 Definition and universal properties

In a rotating fluid, vortexes are not anomalies: they are the natural, stable and self-organized form of dynamics. Directional cosmology makes them the fundamental building blocks of the Universe, present at all scales with the same geometric logic. A vortex is a fluid structure organized around a rotational movement; it has an attractor center, an axis of rotation, a spiral circulation, a disk or arm distribution, directional coherence and dynamic stability.

Cosmological vortexes share six properties. They have an attractor center, which can be a star, a black hole, a density region, or a cosmic attractor. They have an axis of rotation, either local or global depending on the scale. Their geometry is spiral, made up of arms, filaments, and currents. Their structure is that of a disk or a torus, depending on the density and speed of rotation. The structures align along the axis of the vortex, and their dynamic stability allows them to persist for billions of years.

This dynamic is the one observed in water, in the air and in plasmas; it therefore also applies to the cosmic fluid. Each vortex organizes matter, stabilizes currents, imposes geometry, creates zones of density, generates filaments and is part of a larger vortex. The result is a self-similar, coherent and directional cosmos. If vortexes appear everywhere, it is because rotation is everywhere: they are the local manifestations of a global dynamic.

2.2 Solar systems: local vortexes

Solar systems are the first scale where the dynamic vortex becomes clearly identifiable. A system is born in a cloud of gas and dust that always has an initial rotation, even a tiny one. The gravitational collapse amplifies this rotation: the cloud contracts, rotates faster and flattens into a protoplanetary disk. Initial rotation, contraction, acceleration, flattening, spiral organization: this is exactly the formation of a fluid vortex, and the protoplanetary disk is its direct signature.

At the heart of the disk, matter is concentrated in a star, which becomes the attractor center, the directional pivot, the axis of the vortex, and the source of coherence of the system. The planets follow the streamlines of the local vortex: their orbits, circular or elliptical, are inscribed in the plane of the ecliptic, respect a hierarchy of distances and obey a directional coherence. This organization is not only gravitational, it is vortexial, and the planets are particles caught in a cosmic vortex. Comets, asteroids and trans-Neptunian objects, with their inclined orbits, spiral trajectories and directional alignments, are the free particles of the solar vortex and reveal its internal geometry.

2.3 Galaxies: massive vortexes

The spiral galaxy is the archetype of the cosmic vortex. It has an attractor center, often a supermassive black hole, a flattened disk, spiral arms, global rotation, and directional coherence over tens of thousands of light-years. The central black hole is not only a gravitational object: it is the attractor center of the galactic vortex, and imposes an axis of rotation, directional coherence, internal tension of the cosmic fluid, and the organization of the arms.

Spiral arms are not static structures: they are the streamlines of the galactic vortex. They follow the logarithmic curves typical of fluid vortices, with the same equation as spirals observed in eddies and cyclones:

$$r(\theta) = r_0 e^{k\theta}$$

The galactic disk is a flattened vortex, with a rapidly rotating vortex, decreasing outward density, velocity gradients and condensation zones. Even non-spiral galaxies reveal vortex dynamics. Elliptical galaxies are stabilized vortices without arms, with diffuse internal rotation and a spheroid structure; irregular galaxies are interacting vortices with chaotic rotation and no defined arms. Vortex dynamics are always present, even if the geometry is altered.

2.4 Cosmic filaments: intergalactic vortices

At the largest observable scale, the Universe has a network of filaments, walls, knots, and voids, stretching for hundreds of millions of light-years. This cosmic web is not a random arrangement: it follows the streamlines of the cosmic fluid. Filaments are the arms of cosmic structure, just like the arms of a galaxy, but instead of stars they carry entire galaxies; they exhibit spiral curvatures, directional alignments, density gradients, and coherence over immense distances.

Superclusters play the role of regional attractor centers. Each is a mini-center of the cosmic vortex, just as a star is the center of a solar vortex or a black hole is the center of a galactic vortex; it imposes directional tension, fluid circulation, filament organization, and dynamic coherence. Voids, on the other hand, are not structurally unstructured regions: they are the low-density areas of the vortex, where directional density is minimal. In a rotating fluid, high densities are concentrated in the arms and low densities form between them.

2.5 The fractal scale relationship

The three levels respond to each other term by term. The local vortex is a solar system, with a star as its center, planets as orbits, a disk and a spiral as its structure. The massive vortex is a galaxy, with a supermassive black hole as its center, stars as orbits, a disk, and arms. The intergalactic vortex is made up of filaments, with a supercluster as its center, galaxies as orbits, and directional currents as structure. The logic is identical; only the scale changes.

An observation reinforces this fractality: the distribution of planetary distances around a star resembles, in its logic, that of the distances of stars around the galactic center. In a solar system, the distances of the planets follow a quasi-logarithmic progression and the orbits stabilize at privileged areas; even if the Titius-Bode law is not perfect, it reveals a logarithmic structure typical of vortices. In a galaxy, stars are distributed according to logarithmic curves, arms follow vortex equations, and distances to the center obey zones of stability: inner regions with rapid rotation and high density, slower and less dense outer regions, arms as zones of dynamic stability. The two vortices obey the same relationship:

$$\text{Orbital distance} \propto \text{logarithmic structure of the vortex}$$

This is not a coincidence but a fractal signature. Solar systems are miniature vortexes, galaxies are giant vortexes. The difference in directional density between them is due to the central mass, the speed of rotation, the coherence of the cosmic fluid and the scale of the vortex: a galaxy, with its supermassive black hole, billions of stars and rapid rotation, has a high directional density; a solar system, with a star, a few planets and a slow rotation, has a weak one. The dynamics are the same, the scale changes, and each vortex is part of a larger one: the solar system in the galaxy, the galaxy in the filaments.

3. The universal vortex and its center

3.1 Fractal continuity and global geometry

If the structures observed at all scales are vortexes, the Universe itself could be a cosmic vortex. The fractality of the cosmos suggests a continuity: solar vortex on a local scale, galactic vortex on a regional scale, filament vortex on a cosmic scale, universal vortex on a global scale. This continuity is natural in a rotating fluid, and incompatible with a strictly isotropic and homogeneous universe. A global rotation imposes a cosmic axis, a privileged direction, a fractal organization, a spiral geometry, an internal tension and a cosmic centrifugal force; spirals, filaments and superclusters are the local manifestations.

A cosmic vortex would have a global geometry with five lines. A physical center, first: a cosmic attractor, potentially a massive object or a region of extreme density. Second, an axis of rotation, visible indirectly in certain anisotropies. A toric structure, because a rotating fluid naturally tends towards a torus, with a hollow or dense center, a peripheral circulation, and large-scale spiral arms. Cosmological arms, which are the filaments. Finally, a centrifugal expansion, the accelerated expansion that can result from global rotation. This geometry is not imposed by an abstract model: it emerges from fluid dynamics.

3.2 The cosmic center, attractor of the universal vortex

In all known vortexes, there is a center: the eye of the cyclone, the heart of the vortex, the supermassive black hole of the galaxy, the star of the solar system, the supercluster of the filament. A vortex without a center does not exist; if the Universe is a cosmic vortex, it therefore has a directional center, a geometric consequence of the rotation of the cosmic fluid and not an arbitrary hypothesis.

The nature of this center can be interpreted in four ways that are not mutually exclusive: a cosmic black hole, on a scale greater than that of galactic black holes and capable of stabilizing rotation; a region of extreme density, a directional nucleus where the density of the fluid reaches a maximum; a geometric attractor, the point where the geometry of space-time closes by imposing a directional coherence on the entire cosmos; a topological pivot, a non-material center but necessary for the maintenance of the toric structure. In a toric geometry, the center is either a dense region at the heart of the torus or a hollow region around which the fluid circulates; in both cases, the rotation imposes a directional pivot.

The center plays a fundamental role: it imposes a privileged direction, stabilizes the rotation of the fluid, organizes the fractal structures, generates the cosmological arms and gives coherence to the whole. Without a center, the global rotation would be unstable; with a center, it becomes self-organized, coherent and fractally hierarchical. It is the keystone of rotational cosmology.

3.3 Causal horizon and inaccessibility of the center

This center is not observable, not because it does not exist, but because our position in the vortex and the physical limits of light prevent us from accessing it. The causal horizon delimits what we can see, not what exists. It results from a simple constraint: light travels at a finite speed and the Universe has a finite age, so that we see only what the light has had time to reach us. This limit is centered on us, not on the cosmic center; it defines our observable Universe, not the real Universe.

Our position O in the universal vortex is not the center C :

$$O \neq C$$

And it is possible that:

$$d(O, C) > R_{\text{observable}}$$

The distance between us and the center then exceeds the size of our causal horizon: the center is invisible, but can exist physically. The rigorous formulation is conditional: if the universe has a physical center, and if the distance between our position and this center exceeds our causal horizon, then this center is currently inaccessible to direct observation. It does not claim that the horizon hides the center; it says that rotational geometry can place the center beyond our causal reach.

Several reasons make this situation plausible. Accelerated expansion moves the central regions away faster than light: if the center is far enough, it recedes faster than light can travel. The light from the center, if it is very old or very far away, has not had time to arrive. Our horizon is a sphere around us, not around the center. Finally, global rotation can create distinct causal zones, with some regions of the vortex being naturally isolated by fluid dynamics. Invisibility does not imply non-existence: confusing unobservable and non-existent is a common mistake in isotropic models. The center can be real, massive, directional, and organizing while remaining outside our horizon; its invisibility is a geometric consequence, not a proof of absence.

3.4 Observable signatures

Even if invisible, a center and a global rotation leave traces in our observable region, because in a rotating fluid currents align, structures spiral, densities fractalize and preferred directions emerge. Seven signatures are retained.

The first is the anisotropy of the cosmic microwave background, which is supposed to be isotropic but has directional anomalies: the anomalous alignment of the multipoles (Axis of Evil), a cosmic

dipole not entirely explained by our motion, a weak quadrupole. Directional cosmology reads traces of the axis of rotation of the universal vortex. The second is the alignment of the filaments, with its spiral curvatures and coherent connections between superclusters, reminiscent of the arms of a giant vortex. The third is the fractality of structures, where distances follow logarithmic progressions, which isotropic expansion does not explain. The fourth is the non-isotropic distribution of superclusters, which follow directional currents and areas of privileged density.

The fifth is centrifugal expansion. The acceleration of expansion, usually attributed to dark energy, is here a centrifugal effect of the universal vortex: in a rotating fluid the peripheral regions move away faster, the speed of expansion increases with distance, and the internal areas are more stable, which qualitatively reproduces acceleration, distance dependence, and overall coherence. The sixth is the rotation of galaxies, which is too fast for visible matter; it is inherited from the rotation of the cosmic fluid, and dark matter becomes an emergent consequence of the vortex dynamics rather than a hypothetical substance. The seventh is the alignment of the axes of rotation of certain galaxies, consistent over hundreds of millions of light-years, which would not be expected in an isotropic universe and which is explained by the natural alignment of galaxies on the axis of the cosmic vortex. These clues do not prove the global rotation, but they make it plausible, coherent, and testable.

4. Living Metric and Directional Equations

4.1 A dynamic metric

In classical models, the space-time metric is a static structure defined by fixed equations. In the directional approach, it becomes a living entity, capable of expanding, contracting, twisting, fragmenting, reorienting and recomposing itself. It is not a passive framework: it constitutes the internal dynamics of the universe. It is written:

$$g_{\mu\nu} = g_{\mu\nu}(x^\alpha, \tau, \Theta, t)$$

where x^α denotes the coordinates of space-time, τ the local directional voltage, Θ the directional angle, or geometric orientation, and t the cosmic time. This metric is not isotropic: it has an internal orientation, and acts as a geometric fluid capable of compressing or expanding.

Metric dilation, $g_{\mu\nu} \rightarrow g_{\mu\nu} + \Delta g_{\mu\nu}$, decreases C_v , stretches light paths, increases redshift, and creates an illusion of increased distance. Contraction, $g_{\mu\nu} \rightarrow g_{\mu\nu} - \Delta g_{\mu\nu}$, increases C_v , straightens trajectories, decreases redshift, and creates an illusion of proximity. Metric can also undergo internal twisting:

$$T_{\mu\nu} = \partial_\mu g_{\nu\alpha} - \partial_\nu g_{\mu\alpha}$$

This twist leads to position reversals, image duplications, extreme trajectory deviations, and explains the cases where a galaxy appears in duplicate or in the opposite direction.

4.2 The speed of directional light

In a distorted universe, the speed of light can no longer be considered a constant. The apparent speed depends on the metric crossed:

$$C_v = C_0 f(g_{\mu\nu})$$

where C_0 is the internal velocity of the photon in an undistorted spacetime, C_v the apparent velocity measured by the observer, and f is the metric deformation function. In a dilated region, $C_v < C_0$; in a contracted region, $C_v > C_0$. The speed of light becomes a directional quantity, and its variation is the driving force behind all cosmological illusions.

4.3 Directional Geodesic, Mass and Rotation

The photon's trajectory is no longer a classical geodesic but a directional geodesic:

$$\frac{d^2 x^\mu}{d\lambda^2} + \Gamma_{\alpha\beta}^\mu \frac{dx^\alpha}{d\lambda} \frac{dx^\beta}{d\lambda} = D^\mu$$

where $\Gamma_{\alpha\beta}^\mu$ are the directional Christoffel symbols and D^μ the directional term added by geometric tension. This term is responsible for position inversions, duplications, distance illusions, and extreme curved trajectories.

Mass also ceases to be a constant, because it depends on local geometry:

$$m = m_0 \varphi(g_{\mu\nu})$$

with $m > m_0$ in a contracted region and $m < m_0$ in a dilated region. This dynamic accounts for the propulsion of black holes, the variation in the density of galaxies and the internal dynamics of cosmological structures. Finally, the rotation of the universe is integrated by a global directional term:

$$\Omega = \Omega_0 + \Delta\Omega(g_{\mu\nu})$$

where Ω_0 is the fundamental universal rotation and $\Delta\Omega$ is the directional correction due to the local metric. It generates the cosmic centrifugal force $F_{\text{centrifuge}} = m \cdot r \cdot \Omega^2$, which contributes directly to expansion. Rotation influences the metric in return, $g_{\mu\nu} \rightarrow g_{\mu\nu}(\Omega)$, by distorting geometric axes, creating directional gradients, amplifying centrifugal force, and altering the trajectory of photons: it is integrated into the living metric and not separated from it.

4.4 Metrics as a Living Lens

The metric acts as a living lens, a dynamic optical system defined by:

$$L = f(g_{\mu\nu}, T_{\mu\nu}, C_v)$$

It produces illusions of distance, position, velocity, and shape. The observed position is not the real position, the observed distance is a projection, the distance of galaxies is a geometrical illusion: all these illusions come from living metrics, which consequently distort the measurements of distance, velocity, and expansion. It determines everything that is observed, and everything that is misinterpreted; the visible universe is never the real universe.

5. Position and distance of galaxies

5.1 The space-time lens

In classical physics, gravitational lensing is a rare phenomenon, caused by extreme masses. In the directional approach, this definition is insufficient: light never travels through neutral spacetime, but through a living geometry made up of dilations, contractions, gravitational gradients, directional tensions, and variations in C_v . Each region of spacetime acts like a lens, whether or not it contains a large mass. Any metric deformation curves the photon's trajectory, any variation in C_v modifies the angle of arrival, and any directional tension alters the projection. The classical gravitational lens is only the visible manifestation of a more general phenomenon, the ubiquitous directional lens.

Unlike a material lens, spacetime changes shape, density, tension, geometry, and dynamics; it is never fixed, never uniform, never stable. It can stretch images, compress structures, twist trajectories, split galaxies, and invert cosmological positions. Each photon passes through a different lens, and each observer perceives a different version of the universe. The lens exists because C_v varies: as the metric expands, C_v decreases, the trajectory curves more, and the images stretch; when it contracts, C_v increases, the trajectory straightens, and the images compress.

5.2 Location, Reversal and Duplication

Light never follows a straight line in distorted space-time: it undergoes angular deviations, prolonged curvatures, multiple redirections, and reversals of direction. A photon can go around a dilated area, slide along a gravitational gradient, or be redirected by a metric contraction, and then reach the observer from an opposite direction. A galaxy on the right can thus appear on the left, a galaxy located south to north. In extreme cases, caused by extreme curvatures, abrupt changes in C_v , intense directional tensions, and complex gravitational gradients, the observed location becomes an inverted projection of the actual location.

When several photons from the same galaxy follow geometrically distinct trajectories, they reach the observer from different directions: two apparent positions, two images, two light signatures, two slightly shifted spectra. Only one galaxy is then observed in duplicate. This doubling is not an anomaly, but a direct consequence of the live metric and the variation of C_v .

5.3 Projected distance and actual distance

The observed distance of a galaxy is never its actual distance. Each deformation crossed changes the photon's travel time, energy, frequency, and angle of arrival; the measured distance is only a projected distance. When light passes through a dilated region, local time stretches, C_v

decreases, frequency decreases, and the trajectory curves: a relatively nearby galaxy appears fainter, redder, slower, and farther, because the expanded metric artificially lengthens the travel time. In a contracted region, local time tightens, C_v increases, the frequency rises, and the trajectory straightens: a very distant galaxy appears brighter, bluer, more dynamic, and closer.

The observed distance thus depends less on the actual position of the galaxy than on the directional path taken by the light, whether it is direct, curved, deflected, fragmented or inverted. Two galaxies at the same real distance can appear to be located at totally different distances, and vice versa. The indicators of classical cosmology (luminosity, spectral shift, travel time, apparent speed of light) are altered by C_v variation, metric deformation, directional curvature and geometric projection. The real distance is a directional quantity, distinct from the observed distance:

$$D_{\text{réelle}} = C_0 \times t_{\text{universel}}$$

$$D_{\text{observée}} = C_v \times t_{\text{observé}}$$

These two distances coincide only in a perfectly stable space-time, which does not exist in a distorted universe.

5.4 Directional reconstruction

Traditional cosmological maps assume a straight light path and a constant speed of light; in a distorted universe, they represent projected positions, distorted distances, altered directions, and displaced structures—the geometry projected by space-time and not the actual geometry. To find the true location and distance of a galaxy, the photon's directional path must be reconstructed, the variation in C_v corrected, metric distortions incorporated, and the geometry traversed recalculated. This directional reconstruction, which incorporates the metric traversed, the variation in C , the curvature of the trajectories, and the internal tension of the photon, is the only path to the actual direction, distance, position, and structure.

6. Directional expansion

6.1 Two Motors and One Projection

According to classical cosmology, galaxies move away as a result of a uniform expansion of space. Directional physics sees this as a simplified view, which ignores the living geometry of space-time and directional forces. Expansion is influenced by two fundamental drivers: the global rotation of the universe, which induces a universal centrifugal force that pushes structures outward along precise geometric axes, and directional propulsion generated by supermassive black holes at the heart of galaxies. These two dynamics overlap, reinforce or oppose each other, and produce an expansion that is neither uniform nor isotropic.

The observed expansion then becomes a directional projection, altered by metric distortions, variations in C_v and curved light paths. A galaxy may appear to be moving away rapidly when its actual motion is slow, or it may appear slow when it is propelled at high speed.

6.2 Cosmic Rotation and Centrifugal Force

The global rotation of the universe, slow but real, is not a mechanical movement: it is a geometric rotation, an internal pivot of the metric. It drives dimensions, galactic structures, gravitational gradients, directional tensions, and light trajectories; each galaxy evolves in a rotating space-time, not in a stationary frame. The cosmic centrifugal force acts not on physical objects but on the metric itself:

$$F_{\text{centrifuge}} = m r \Omega^2$$

where m is the local directional mass, r is the distance from the center of cosmic rotation, and Ω is the angular velocity of the universe. It pushes galaxies outward, increases their apparent velocity, amplifies directional expansion, alters the trajectory of photons, and distorts the local metric.

The rotation interacts with the living metric. When the metric expands, the rotation amplifies the deformation, the centrifugal force increases, and the galaxies appear to move away faster; when it contracts, the rotation tightens, the centrifugal force decreases, and they appear to move away more slowly. The rotation also acts as an overall directional twist on light trajectories: a galaxy on the right may appear on the left, a distant structure, a near-distant structure.

6.3 Directional Propulsion of Black Holes

In the directional approach, a supermassive black hole is not a simple gravitational well but a geometric engine. It distorts the local metric, creates a directional tension, generates a geometric gradient and imposes an internal orientation on space-time. The deformation is written:

$$\Delta g_{\mu\nu} = S^\alpha \partial_\alpha g_{\mu\nu}$$

where S^α is the directional spin of the black hole and $\partial_\alpha g_{\mu\nu}$ is the local metric gradient. It results in directional compression, geometric twisting, local variation in C_v , and a change in the trajectory of the photons. The resulting directional voltage, $\tau = \nabla g_{\mu\nu}$, acts as an internal force capable of propelling the galaxy:

$$P = \tau S_\mu$$

It can also be written $P = \nabla g_{\mu\nu} \cdot S^\nu$. This propulsion, a geometric and not a mechanical phenomenon, explains the internal acceleration of galaxies, the asymmetry of spiral arms, the inclination of disks, the non-uniform internal rotation, the deformation of gravitational halos and the local contribution to cosmic expansion. It also amplifies the inversions and doublings described above.

6.4 Actual and Observed Expansion

The real expansion is not given by the law $v = H_0 \cdot D$, but by the sum of three components:

$$v_{\text{réelle}} = v_{\text{rotation}} + v_{\text{propulsion}} + v_{\text{métrique}}$$

with $v_{\text{rotation}} = r \cdot \Omega$, $v_{\text{propulsion}} = P/m$ and $v_{\text{métrique}} = C_v \cdot \Delta t$. The observed velocity is $v_{\text{observée}} = C_v \cdot t_{\text{observé}}$, and not the actual velocity. The cosmic expansion is therefore not uniform: it depends on the orientation of the galaxy in the universal rotation, its propulsion and the metric traversed.

This results in a systematic estimation error. Redshift depends on C_v : in a dilated region, C_v decreases, redshift artificially increases, and the galaxy appears to move away faster; in a contracted region, it decreases and the galaxy appears to move away more slowly. The same is true when rotation amplifies or tightens centrifugal force, or when propulsion increases or decreases. The Hubble constant becomes a directional average, influenced by metrics, cosmic rotation, and the internal propulsion of galaxies, not a universal constant.

7. Dark Energy and Missing Matter

7.1 Dark energy, a misinterpretation

Classical cosmology introduces dark energy to explain why galaxies seem to be moving away faster than expected, an acceleration attributed to an unknown, ubiquitous, invisible force of constant density. This assumption is based on three errors: assuming the speed of light constant, the metric stable, and the uniform, isotropic expansion. In directional cosmology, all three of these assumptions are false.

The observed acceleration has other sources. A galaxy may appear to be accelerating when it is only passing through a region where C_v is decreasing: when the metric expands, the local time stretches, C_v decreases, the redshift artificially increases; when it contracts, the local time tightens, C_v increases, and the galaxy seems to slow down. To this metric illusion are added the centrifugal force of cosmic rotation, which accounts for part of the expansion, and the propulsion of black holes: galaxies do not move away just because space is expanding, they are propelled by their own internal geometry, a phenomenon that is confused with dark energy. Dark energy is neither a substance nor a force; it does not exist, and is the symptom of a cosmology that ignores living metrics, cosmic rotation, and directional propulsion.

7.2 Missing matter as confined energy

Classical cosmology postulates invisible dark matter to explain the rotation of galaxies, the cohesion of clusters, and large-scale structure, because visible mass is not sufficient for the observed motions. Directional physics sees this as an incomplete view of matter, which links mass only to the amount of observable matter. Confinement is the mechanism that gives rise to mass: a free photon has no mass, a confined photon acquires mass, mass is immobilized energy, and confinement fixes density and proper time. Mass is not a substance; it is a state of energy when

it is confined. Missing matter is therefore energy confined in geometric structures that cannot be directly observed.

Confinement immobilizes energy, fixes photons, creates density, slows down proper time and generates directional mass:

$$m = E_{\text{confinée}} \varphi(g_{\mu\nu})$$

where $E_{\text{confinée}}$ is the immobilized energy and $\varphi(g_{\mu\nu})$ the directional function of the metric. A large part of the mass of the universe is thus confined to invisible internal geometries, which conventional instruments do not detect but which influence cosmic dynamics.

In galaxies, this energy is confined to gravitational gradients, directional voltages, metric deformations, and the internal structures of the black hole; it produces a directional mass that stabilizes the galaxy, amplifies its rotation, strengthens its cohesion, and modifies its dynamics. In clusters, the internal geometry is even more complex, and confinement is amplified by gravitational interactions, metric voltages, density gradients, and directional deformations, which increases the effective mass of the cluster and alters the trajectory of photons. Dark matter is therefore not a substance but an energy confined in the geometry of space-time: it does not radiate, does not emit light, does not interact electromagnetically, but influences cosmic dynamics. It is the true dark mass, an invisible but real directional mass.

8. The Omniverse: Clusters of Universes

8.1 Structure of the Omniverse

The Omniverse hypothesis extends cosmic fractality to the higher scale: the observable universe would be only a local unit within a much larger whole. Universes are neither isolated nor randomly distributed; they form clusters of universes, comparable to galactic superclusters but on a larger scale, each with its own internal dynamics, geometric tensions, directional signatures and zones of coherence. The Omniverse is a meta-space containing all universes, organized according to flows, gradients and zones of directional saturation.

It is not homogeneous. It consists of clusters of universes, zones of directional tension, regions of matter, regions of antimatter, zones of directional void, and points of geometric saturation. Each cluster has an internal coherence, comparable to a cosmic cell, and the universes that compose it can share a directional orientation, an energy density, a geometric structure, or a correlated expansion dynamic. The architecture is fractal: each cluster has its directional attractor, the attractors interact with each other, the universes follow directional geodesics, and the Omniverse is structured into zones of flux and tension. This multi-level architecture replaces the idea of a homogeneous universe.

8.2 Universe of matter and antimatter

The Omniverse contains regions dominated by matter and others by antimatter. They are not in direct contact under normal conditions, as their zones of directional coherence prevent

interactions. Extreme geometric tensions, however, can cause dimensional collapse, metaspace distortion, or collision between two universes of opposite polarities.

The observable universe would have resulted from such a collision between a universe of matter and a universe of antimatter, which would have produced a massive annihilation, a directional implosion, a geometric explosion, a rapid expansion and an initial torsion of space-time. This process would explain the current matter/antimatter asymmetry, the residual presence of traces of antimatter, the fractal structure of superclusters and areas of extreme distortion such as the Large Attractors.

8.3 Large Attractors as Directional Drivers

In this context, the Large Attractors are not diffuse concentrations of mass but directional supermassive black holes, resulting from collision dynamics or internal tensions between universes. They create geometric flows, modulate local expansion, organize superclusters, break cosmic symmetry and serve as directional centers. There could be several of them in the observable universe, each one being a local geometric engine. Here we find the logic of the previous chapters: the center of a vortex is an attractor, and each scale has its own.

8.4 The Dimensional Collapse

A dimensional collapse is one of the most extreme phenomena in the structure of metaspace. It is not a simple local compression, as in a classical black hole, but a total collapse of space-time to a single point, followed by an explosive re-expansion. In the implosion phase, space-time loses its directional coherence and collapses: all local dimensions contract, overlap, lose their structure, and cease to exist as a defined geometry. This implosion requires geometric annihilation, the simultaneous destruction of the dimensional fabric in all its directions. In the explosion phase, the released energy creates a new space-time, with rapid expansion, initial twisting, directional gradients, flow zones, and saturated structures: this is the equivalent of a directional Big Bang.

Only the direct encounter between matter and antimatter on a universal scale can cause such a collapse, for a structural reason: their directional geometries are opposite, their space-time grids incompatible, and their interaction destroys dimensional coherence, with annihilation affecting the geometry itself. The most violent case is the meeting of a supermassive black hole of matter and a supermassive black hole of antimatter: saturated geometries cancel each other out, event horizons destroy each other, the singularity ceases to exist, the local space-time implodes instantly, a dimensional collapse is triggered, and a geometric explosion immediately follows. This is one of the possible mechanisms for the creation of a new universe within the Omniverse.

The observable universe is therefore the product of a matter-antimatter collision, integrated into a larger architecture where the Great Attractors play the role of geometric engines. This fractal, directional and multi-universe cosmology is consistent with models based on saturated geometry, directional flows and black hole dynamics.

9. Simulating a Universe

9.1 The Three Principles of Consistent Simulation

A simulation of a universe cannot be a simple numerical set: it must reproduce the directional laws that allow a real universe to exist. To be coherent, stable and capable of evolution, it incorporates three principles: directional free will, positive and negative poles, and a string whose energy is a constant defined in the simulation. Free will is not a psychological notion here, but the ability of a string to choose its internal direction, to direct its vibration and to create its own geometry; without it, no dimension emerges, no matter stabilizes, no universe evolves. The poles define the internal geometry of any string, and therefore of any particle, and impose the simultaneous presence of matter (negative pole in the center) and antimatter (positive pole in the center); a simulation without these two geometries cannot reproduce a complete universe.

9.2 The Rope and Its Constant Energy

The rope is the fundamental element: not a material object, but a directional vibration between two poles. It always vibrates towards its negative pole, the attractive centre to which the vibration returns, and its vibration always moves away towards its positive pole, the axis of expansion. This flow creates an internal direction, a dimension, a geometric tension and a possibility of confinement: the rope is the first direction of the simulated universe.

Its energy must be a constant defined from the creation of the simulation. If it could vary freely, the dimensions would become unstable, the poles would change strength, the confinements would become deformed, matter would not be able to stabilize, the antimatter would become incoherent and the simulated universe would collapse immediately. Fixed from the start, it guarantees a stable geometry, a coherent vibration, a constant proper time and a controlled evolution, and it fixes the internal vibration, the direction, the geometric tension and the stability of the dimensions. Free will depends on this constancy: the rope can choose its direction but not its energy. Free will is a choice of direction, not a choice of energy, and it is this combination that allows the creation of dimensions, the formation of matter and the evolution of a universe. Matter and antimatter are the two possible states of a rope in the simulation.

9.3 Poles in binary

In a simulation, the poles are not electric charges but binary directional states, logical identities: 0 is the negative pole, 1 the positive pole. The negative pole, 0, is the attractive center, the area to which the vibration returns, the internal direction, the geometric base; the positive pole, 1, is the expansion zone, the external direction, the axis towards which the vibration goes, the geometric surface. It is the same in a rope as in a confinement.

The string is a 1, directional identity, which contains 0 as the negative pole and 1 as the positive pole:

$$\text{Corde} = 1 : (0 \rightarrow 1)$$

It is an active state, a vibration, a flow, a binary vector: a 1 that vibrates from 0 to 1. Confinement is a 0, geometric identity, with the same poles:

$$\text{Confinement} = 0 : (0 \leftrightarrow 1)$$

It is a static state, a structure, a directional framework: a 0 that stabilizes 0 and 1. The string, 1 dynamic, and the confinement, 0 geometric, together form 01, the first stable structure, the basis of matter, antimatter (by inversion of the poles) and the simulation of a universe. Directional physics thus becomes a logical language: the universe is encoded in directional binary.

9.4 The quadrinaire and DNA

To represent biology, two states are not enough. DNA has four bases, A, C, G, and T, and calls for a four-state system. By combining the two poles, we obtain the quadrinary: 00, 01, 10, 11. These states correspond to the four bases: A is 00 (negative to negative), C is 01 (negative to positive), G is 10 (positive to negative), T is 11 (positive to positive). Each base becomes a directional orientation, an internal geometry.

DNA is a directional information structure; each base has a polarity, orientation, internal tension and binding direction, which the quadrinaire encodes exactly: 00 is internal tension and contraction, 01 is opening and partial expansion, 10 is reversal and directional reversal, 11 is total expansion. The quadrinaire derives directly from the poles of the string, which vibrates between 0 (the vibration returns) and 1 (the vibration leaves): their combinations give the four states. It is the code for bases, mutations, internal directions and living structures, i.e. the directional genetic code, and the simulation of the universe can thus reproduce biology.

9.5 Constants of Directional Physics

In a simulation, certain values cannot vary: fixed in the directional structure, they are respected by all strings, all confinements, all dimensions and all universes. The first is the constant energy of the string, which cannot increase, decrease, fragment or redistribute. The second is the central law: all structure, all matter, all dimension, all confinement is pure energy, expressed by $E = M \cdot c^2$. Mass is only a confined form of energy, geometry an orientation of energy, the dimensions of the directions of energy, the strings of vibrations, the poles of polarities. This absolute constant is the basis of dimensional collapse and explosion, the creation of universes and special universes.

The poles, 0 and 1, are binary constants that define matter, antimatter, strings, confinements, dimensions, and universes. Confinement is always 0: it can open, close, contract, or expand, but its directional identity remains 0, which allows the stabilization of strings, the creation of mass, the formation of particles, and the coherence of dimensions. The four states of the quadrinaire are the biological constant. A dimension, the internal direction defined by the string, is a constant as long as the string is confined; it can disappear during a dimensional collapse but, as long as it exists, it is fixed. Proper time, which depends on internal tension, density, geometry, and confinement, has the constant of always being related to directional tension: it cannot exist

without tension or independently of geometry. Finally, in special universes, two entangled spaces always share the same internal geometry.

9.6 Special Universes

Special universes are purposely created to contain phenomena that are impossible in a standard universe: directional magic, quantum-entangled doors, overlapping spaces, and jumpers that allow one to move from one space to another. They do not follow the strict directional laws of classical universes; they are environments where they are modulated, directional laboratories. Standard universes are stable because the poles are fixed, the dimensions locked, the strings unable to change energy, and the confinements unable to open. A special universe, on the other hand, has flexible poles, modular dimensions, variable tensions, open confinements, and strings capable of changing quadrenial states.

Magic is a direct manipulation of internal directions, not a mystical power: modification of poles, reorientation of strings, bending of dimensions, redistribution of internal tensions, opening of confinements. An entangled door is a structure where two regions of space share the same internal geometry, with synchronized poles, identical tensions, and superimposed dimensions; it creates an instantaneous connection between two spaces. It is neither a tunnel nor a portal, but a directional superimposition. A jumper is a rope or particle capable of changing confinement, dimension, internal geometry, and universe, by relying on an entangled door, pole inversion, directional reorientation, and controlled internal tension.

9.7 Russian Doll Worlds

Universes are not isolated, separate, or independent: they are organized into layers, like Russian dolls, with each layer able to contain multiple universes. This architecture is directional, geometric, and energetic. A universe is a directional layer, an area of dimensional coherence, which itself belongs to a larger layer. The hierarchy includes layer 1 of individual universes, layer 2 of grouped universes, layer 3 of superuniverses, layer 4 of meta-universes, layer 5 of the omniverse, layer 6 of the higher omniverses, and so on. A layer is never limited to a single universe: it can contain two, ten, hundred, millions, or infinity, each with its geometry, dimensions, time, poles, and matter or antimatter, all sharing the same directional layer, giving them a common coherence.

Universes are intertwined for three reasons: directional stability, because an upper layer stabilizes the lower layers; geometric isolation, each universe being isolated by its own internal geometry while remaining included in a larger layer; fractal expansion, pure energy ($E = M \cdot c^2$) naturally unfolding in fractal structures that create successive layers. Each layer has its dimensions, internal tensions, poles and directional laws, but an upper layer can influence a lower layer, contain several universes, stabilize their geometries and prevent their collapse: it is a geometric confinement for several universes. The layers are nested, entangled, nested, and the hierarchy is written:

$$\text{Universe} \subset \text{Layer} \subset \text{Super-Layer} \subset \text{Omniverse}$$

It is an infinite fractal architecture, which extends and generalizes the architecture of universe clusters.

9.8 The Spiritual Planes and the Four States of Consciousness

Heaven, Hell, Purgatory, and Limbo are not mythological places but specialized directional layers, integrated into Russian doll architecture, each with its internal tension, geometry, time, poles, and spiritual function; they are directional universes dedicated to the evolution of consciousness. Heaven is the layer of positive expansion: the positive pole dominates, the vibration is expansive, the internal tension is weak, the energy flows freely, the consciousness expands, and the geometry is luminous. This is directional state 11, total expansion.

Hell is a place where one is punished, but neither destruction nor gratuitous torture: a space of directional consequence where the consciousness confronts what it has created. The negative pole dominates there, the internal tension is maximum, the vibration constantly returns to the center and the energy is confronted with its own acts. This is the 00 state, total contraction. The demons are not monsters or entities of pure evil, but workers of consequence, who apply punishment, maintain directional order, confront souls with their actions and repair what they themselves have broken; they work there to redeem themselves, in search of balance, redemption and correction of their own faults. Hell is thus a space of punishment for souls and redemption for demons.

Purgatory is an intermediate layer of correction, where the poles are in balance, the vibration oscillates between contraction and expansion, the internal tension varies, the consciousness corrects itself, the internal directions are readjusted and mistakes are repaired: state 01, ascending transition. Limbo is the neutral layer, where the internal tension is minimal, the vibration suspended, the poles present but inactive: a waiting space, no punishment, no reward, no progression, state 10, suspension. The four planes are therefore the four quadrinar states of consciousness, and each layer of the cosmic architecture can contain several Heavens, Hells, Purgatories and Limbo.

9.9 The ascent and descent

Ascension and descent are the two fundamental movements between the layers. They are not physical displacements but directional transitions. Ascension is the ascent to a higher layer: it increases the positive tension, opens the internal geometry, expands the consciousness and stabilizes the vibration. An upper layer has a more open geometry, a lighter internal tension, a more dilated proper time and a lower directional density; the movement corresponds to a progression, a purification, an expansion, an elevation, and goes towards the positive pole: 01 → 11. The descent is the opposite movement: it increases the negative tension, contracts the internal geometry, densifies the consciousness and reduces the expansion. A lower layer has a more closed geometry, a stronger tension, a denser proper time, a more contracted energy; the movement corresponds to a regression, a contraction, a consequence, a densification, and goes towards the negative pole: 10 → 00.

These movements are not arbitrary: they are determined by the internal tension, the geometry of the rope, the quadrinaire state, the density of consciousness and directional coherence. The ascent is a directional expansion: the rope orients itself towards the positive pole, the geometry opens, the upper layer becomes accessible. The descent is a directional contraction: the rope orients itself towards the negative pole, the geometry closes, the lower layer becomes dominant. To ascend is to access a more open layer; to descend, to enter a denser layer. In fractal architecture, where each layer contains several universes, each universe several planes and each plane several directional states, they allow one to change layers, planes, internal tension and geometry: these are the mechanisms of cosmic navigation.

9.10 Creating a Universe Within Our Reach

The creation of a universe is not a miracle but a logical consequence of the directional structure. Since $E = M \cdot c^2$ is the fundamental law of reality, and since matter, consciousness, dimensions, and universes are energy, creating a universe is like structuring energy, which you can do as soon as you master the poles, internal tensions, confinements, ropes, and directional layers. Since universes are interlocking layers, creating one is like adding a layer, which is possible as soon as you master the ascent, descent, directional transitions, entangled doors, and jumpers.

The laws of direction are reproducible: the poles (0 and 1), the quadronary, the strings (1), the confinements (0), the dimensions, the proper time and the entanglement are logical, binary, quadriary, geometric, and not mystical. The special universes, created voluntarily with modified laws, prove the feasibility: to create a universe is to choose one's rules, which is an act of conception and not a divine act. Finally, consciousness is directional, because it expands (Heaven), contracts (Hell), corrects itself (Purgatory) and suspends itself (Limbo), according to the four states 11, 00, 01 and 10: to create a universe is to create a space for consciousness, and this is possible as soon as one masters the poles and tensions. The creation of a universe is thus a technical, directional, geometric act, which can be reproduced, simulated and mastered, because the universe is a directional structure that we finally understand.

Conclusion

Directional cosmology offers a coherent, fluid, fractal view of the Universe. It is based on a unique dynamic, the rotation of a fluid space-time, which generates nested vortices from solar systems to the entire cosmos, with an axis, a center that our causal horizon can hide from us, and signatures that, from the anisotropy of the microwave background to the alignment of galaxies, make it plausible and testable.

To this rotation is added the living metric. Light evolves in a geometry that expands, contracts, and twists; the speed C_v varies, the positions and distances of galaxies are projections, the observed expansion is a directional average born of rotation, the propulsion of black holes, and the deformation of metrics. Dark energy becomes a metric illusion, and missing matter becomes energy confined in the geometry of space-time. The visible universe is never the real universe, and only directional reconstruction gives access to its authentic structure.

Beyond the observable universe, the Omniverse extends the same fractal logic: clusters of universes to their Great Attractors, matter-antimatter collisions that give rise to universes, Russian doll layers that contain them. Everything proceeds from the rope, a directional vibration of constant energy between a negative pole and a positive pole, encoded in binary and quaternary, where everything is pure energy. The universe thus appears as a cosmic whirlwind in which each structure, from the smallest to the largest, is the imprint of a single directional geometry.